

CANADA
DEPARTMENT OF MINES AND RESOURCES

MINES, FORESTS AND SCIENTIFIC SERVICES BRANCH

NATIONAL MUSEUM OF CANADA

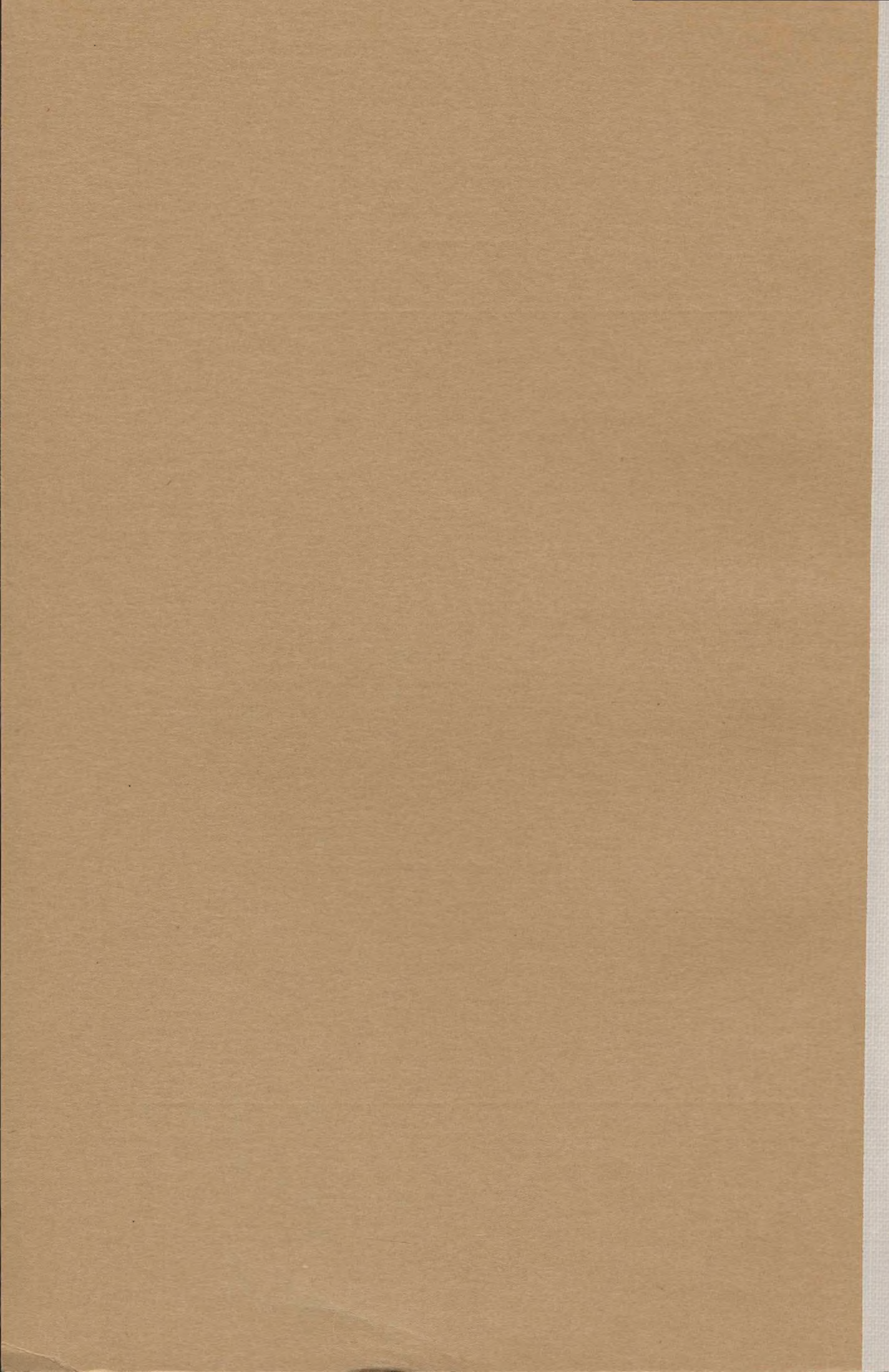
BULLETIN No. 118

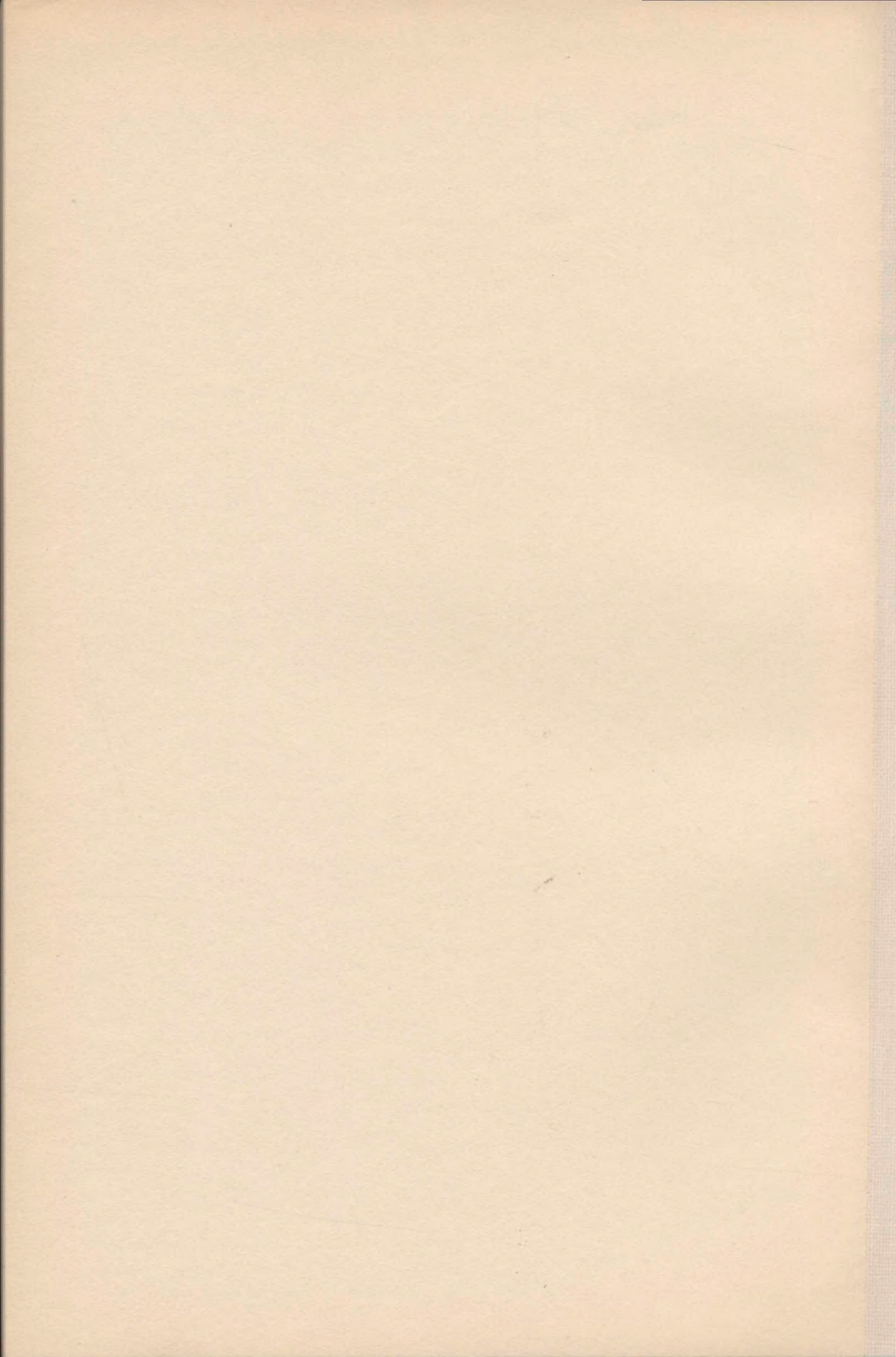
**Annual Report of the National Museum
for the Fiscal Year 1948-1949**

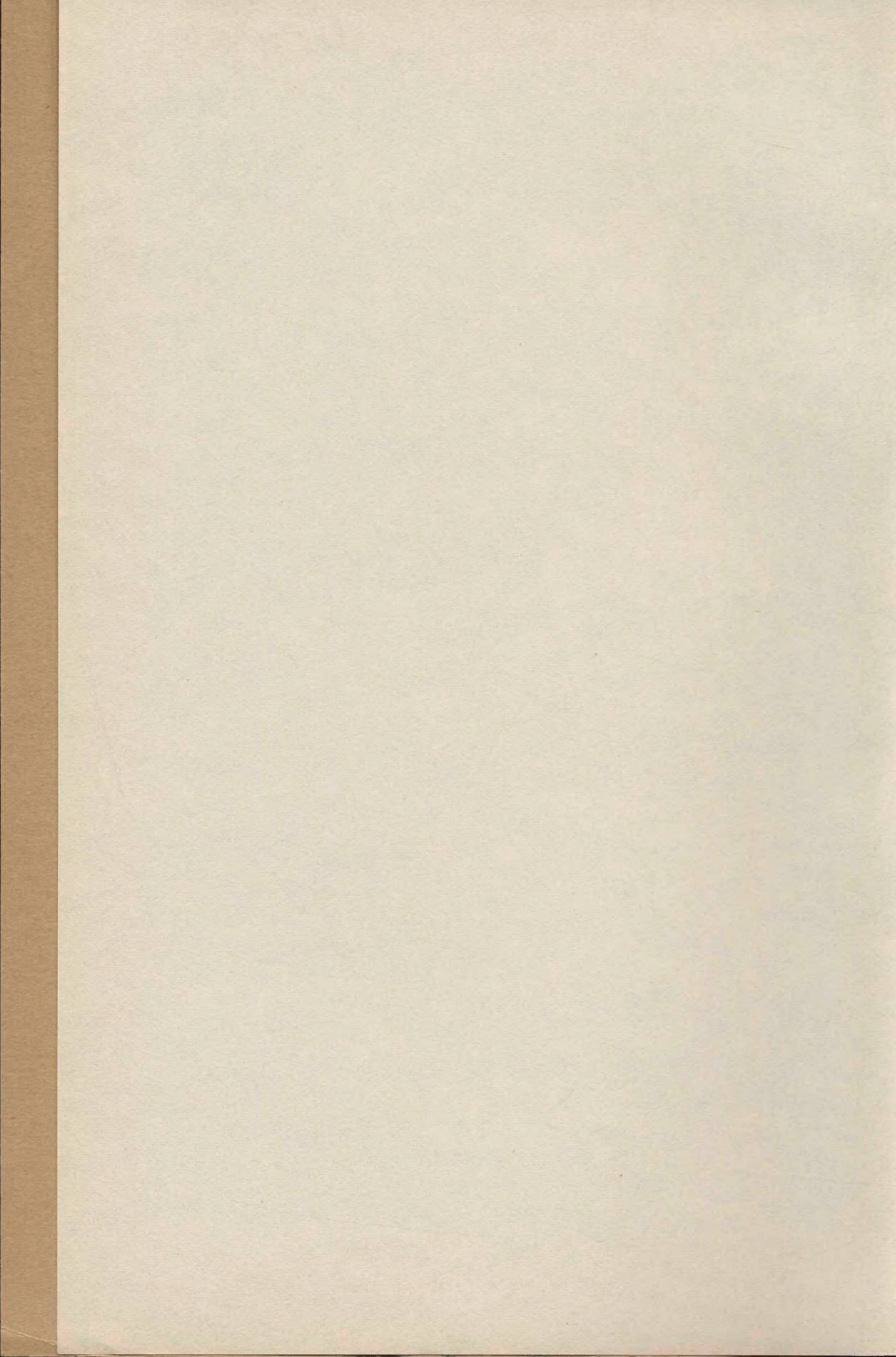


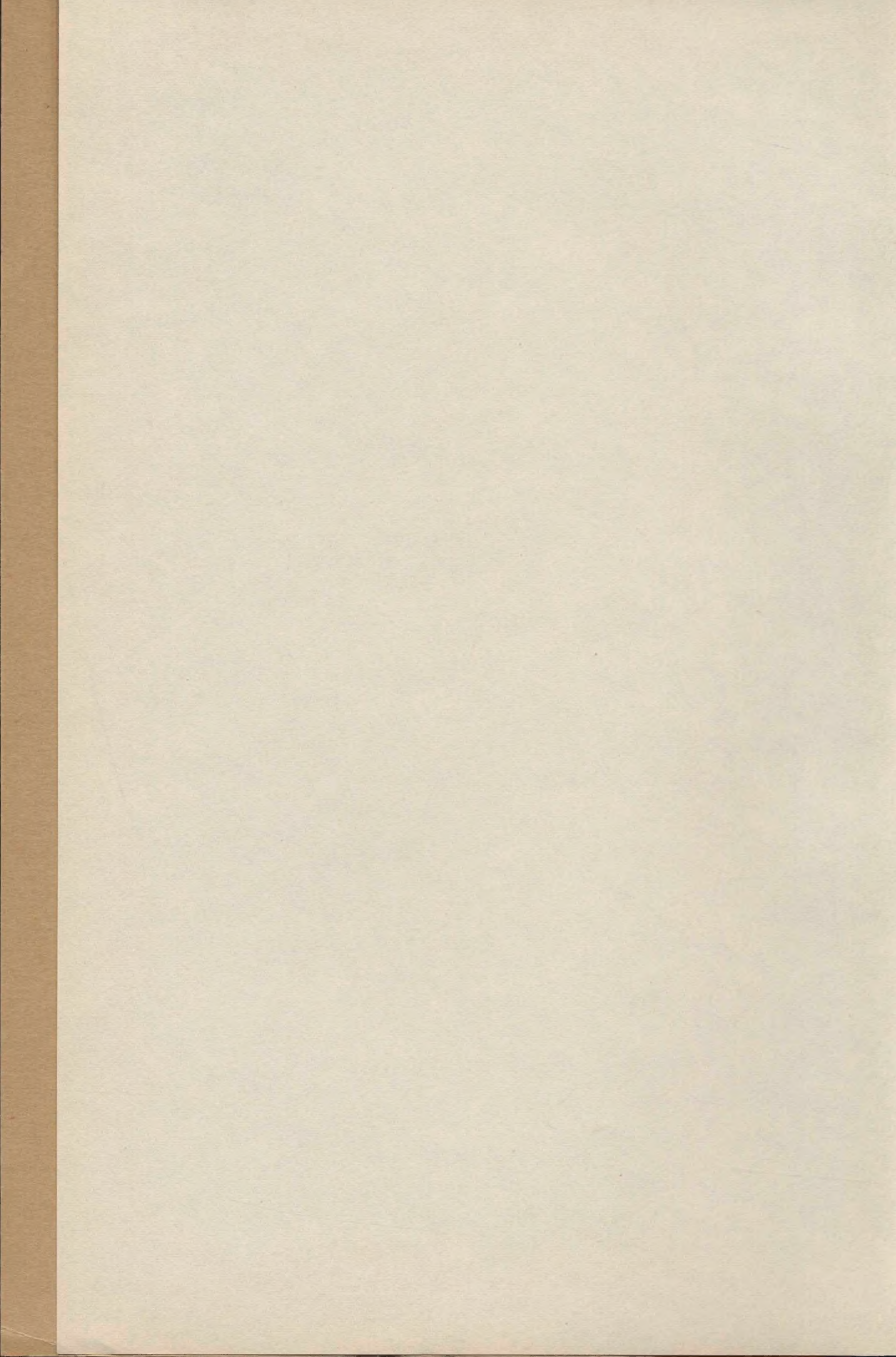
OTTAWA
EDMOND CLOUTIER, C.M.G., B.A., L.Ph.,
KING'S PRINTER AND CONTROLLER OF STATIONERY
1950

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Beaver habitat group.

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NATIONAL MUSEUM OF CANADA

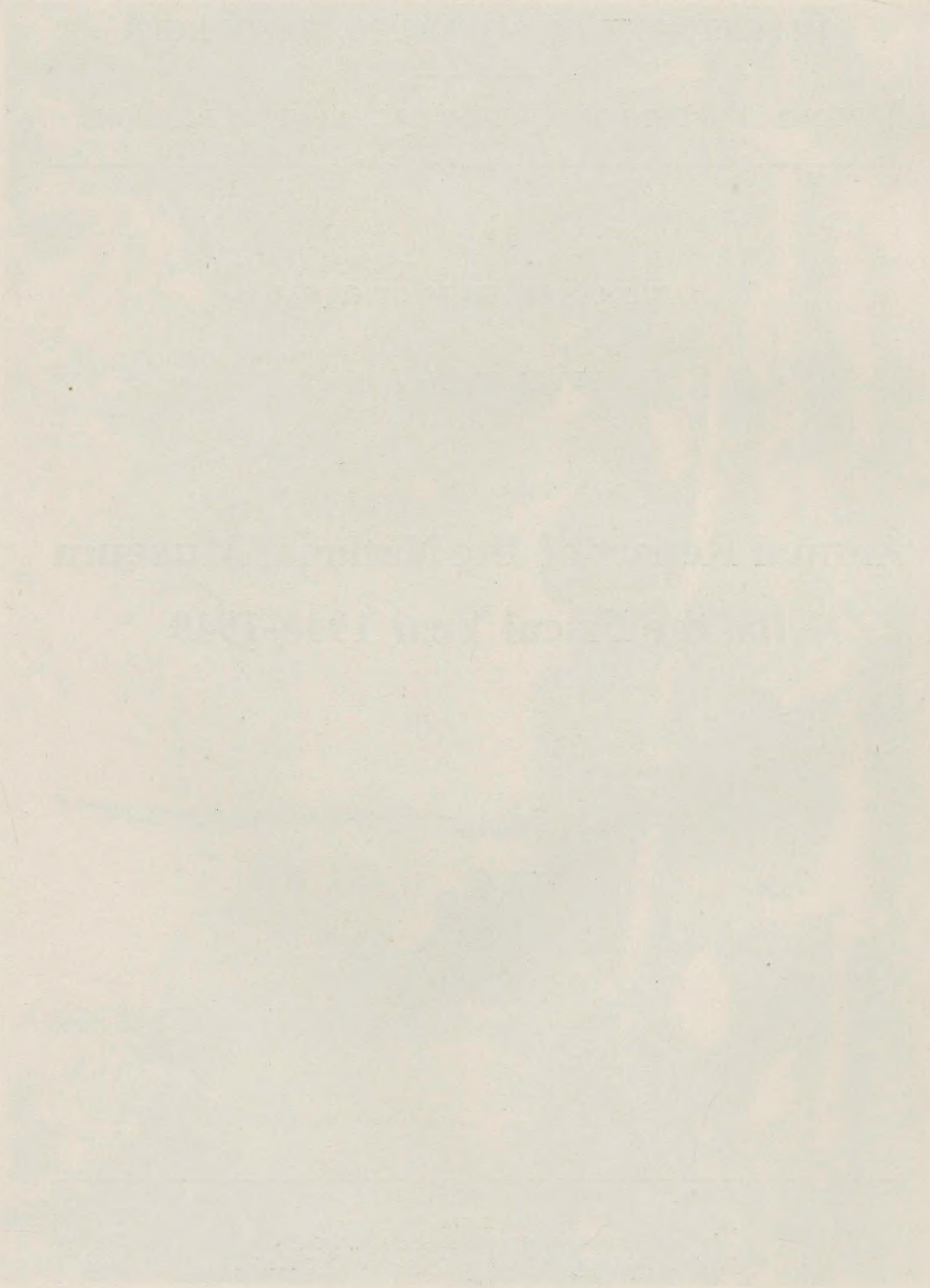
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GENERAL ACTIVITIES OF THE NATIONAL MUSEUM OF CANADA

By F. J. Alcock, Chief Curator

The work of the National Museum of Canada made considerable progress during the year 1948. The results of field work were satisfactory and a wealth of information and specimens was obtained for systematic scientific study. Additions were made to public displays in exhibition halls, and educational activities were expanded.

Ethnological investigations were carried on in British Columbia, Quebec, and Nova Scotia; archæological research in the Prairie Provinces, in the Yukon, in northern Quebec, and on Baffin Island of the Eastern Arctic; studies of birds and mammals in southwestern and central western Saskatchewan, and botanical work in Manitoba and the Yukon.

The Biological Division completed the beaver habitat group, which is a splendid addition to the mammal exhibits. Work on a red fox group was begun. The mineral hall was made more attractive by two large paintings showing officers of the Geological Survey at work in the field. One represents Sir William Logan, its first Director, at Percé in Gaspé, and the other a recent field party at work in British Columbia. An Eskimo painting and an Indian painting were also completed and hung in the west anthropological hall. A large painting was begun for the Hall of Vertebrate Palæontology. When completed it will show what the three horned dinosaurs, whose skeletons are on exhibit, were like when alive. In addition to the regular educational projects, the National Museum broadened its activities. During the months of July and August a film program, "Canada in Colour" was shown in the afternoons from Monday to Friday to give visitors to Ottawa an opportunity of seeing other interesting parts of Canada. The celebrated Marsh collection of water colours on Eskimo subjects was on exhibit in the rotunda for part of July and August, and attracted much favorable comment. The unusual program presented by the Marionette Group of the May Court Club of London on October 29 and 30, included the dramatization of an Indian legend from the National Museum collection. Its enthusiastic reception demonstrated that this is one effective method of arousing interest in Canadian folk-lore.

In September the National Museum joined with the Ottawa Field-Naturalists' Club in organizing a group of junior field naturalists to be known as the Macoun Field Club. The National Museum provides suitable quarters for meeting under staff supervision, and the Ottawa Field-Naturalists' Club provides leaders and direction. The Club has been named in honour of John Macoun, who was the first naturalist on the Museum staff. It is hoped that this activity will stimulate an interest in natural history. A coast-to-coast broadcast over C.B.C. stations on Dinosaurs in Canada by W. A. Bell and C. M. Sternberg of the Museum staff brought in hundreds of requests for additional information on the subject and appreciative letters from all parts of Canada.

During the year Dr. C. E. Cairnes was made Curator of Geology, Dr. E. Poitevin, Curator of Mineralogy, and Dr. W. A. Bell, Curator of Invertebrate Palæontology. These three officers of the Geological Survey staff will serve to maintain co-operation between that Bureau and the National Museum. In November, Mr. Austin W. Cameron was added to the staff as junior mammalogist. Messrs A. E. Ingram and Arthur Price were appointed as artists. Mr. Price resigned later in the year.

The Museum lost with regret, through superannuation, the services of Dr. Marius Barbeau who has been Anthropologist on the staff for 37 years. His chief contributions to Canadian anthropology have been his studies of the Indians of the North West Coast and of the folk songs and folk-lore of French Canada. The Museum now has in its collections over 10,000 Indian and French folk songs. His writings cover a wide field from folk songs, folk tales and Indian legends to scientific publications. Another distinguished member of the staff who retired during the year was Dr. Diamond Jenness, formerly head of the Division of Anthropology. In 1941, Dr. Jenness was lent to the Department of National Defence for intelligence work. He was a member of the Canadian Arctic Expedition, 1913-16, and is a recognized authority on the Indians and Eskimos of Canada. He is well known in the scientific world for his contributions to anthropological publications. The Museum was honoured in the person of A. E. Porsild, Chief Botanist, when on November 30, 1948, he received the insignia of the Most Excellent Order of the British Empire, awarded him on July 1, 1946, for work done for the Intelligence Services during the war.

An Annual Report for the fiscal year 1947-48 was issued, the first report of this character since 1939, and a bridging volume of Annual Reports 1939-47 has been prepared for publication. In addition, six other Museum bulletins were published.

The National Museum was represented at the meeting of the American Association of Museums in Boston during May by W. K. W. Baldwin, and at the Northeastern Conference of that Association in Rochester, N.Y., October 15 and 16 by Miss M. W. Godwin.

The first Annual Meeting of the Canadian Museums Association was held at the National Museum in September 1948. The principal speaker was Sir Eric Maclagan, formerly Director of the Victoria and Albert Museum in London, England. The Curator of the National Museum gave an address, "The Functions of a Scientific Museum".

EDUCATIONAL WORK

The increase in the number of visitors during the year to the National Museum, especially school groups of all ages, from primary grades to college and normal school students, and the increasing demand for its various educational services, demonstrated the increasing awareness of educators and others of the value of the Museum as a source of scientific and educational information. It is through this channel that the results of conservation and research are interpreted, by means of correspondence, publications, and visual aids, as well as through direct participation in the various Museum activities.

The total attendance during the year was 225,048. Visitors to the exhibition halls were 150,000, and included scientists, teachers, students, and the general public. Special Museum activities had an attendance of 68,648. The scientific staff arranged appropriate educational exhibits for organized study groups, one of which had an attendance of 6,400.

A new project was the summer motion picture program, "Canada in Colour" arranged with the collaboration of the National Film Board. The programme was shown in the Museum lecture hall, in the afternoons, Monday to Friday, during July and August. Although these showings were arranged chiefly for tourists visiting the Museum, they were well patronized by Ottawa citizens.

An exhibit was prepared illustrative of the National Museum's educational work for children, at the request of the Children's Museum Committee of the International Council of Museums. The exhibit was for display in Paris at the First Biennial Conference of the International Council of Museums at UNESCO House, June 28-July 3, and was part of an exhibition designed to show European museum workers what museums can do and are doing for children. The National Museum display, later, was circulated among French schools and colleges for demonstration purposes.

NATIONAL MUSEUM LECTURES

The Lecture Committee, consisting of F. J. Alcock, Chairman, Marius Barbeau, W. E. Godfrey, M. F. Goudge, Clyde L. Patch, H. M. A. Rice, H. J. Scoggan, and Miss M. Godwin, Secretary, reports a very successful year.

The lectures continued to attract capacity audiences and had a total attendance of 21,475. There were 7,975 adults at the Wednesday evening lectures, and 13,500 children came to the Saturday morning programs.

The following lectures were given to the adult audiences:

- The New India, by The Honourable Hardit Singh Malik, C.I.E., O.B.E., I.C.S., High Commissioner for India, Ottawa.
- Problems of the Snows, by Robert F. Legget, M. Eng., M.E.I.C., Director, Division of Building Research, and Chairman, Associate Committee on Soil and Snow Mechanics, National Research Council, Ottawa.
- Motion Picture Program: Down to the Sea and The Raider.
- Canada's Pioneer Chatelaines, by Sophy L. Elliott, Westmount, Que.
- Wanderings in Scandinavia and the British Isles, by M. B. Davis, B.Sc., M.Sc., Dominion Horticulturist, Central Experimental Farm, Ottawa.
- The Iron Empire of Ungava and Labrador, by J. A. Retty, Ph.D., Montreal, Que.
- A Motion Picture Program, Bush Christmas, shown through the courtesy of the Australian High Commissioner and J. Arthur Rank Films, Limited.
- The Impossible Takes a Little Longer, by R. H. Hall, Bell Telephone Company of Canada, Montreal, Que.
- Traditional Architecture of Quebec, by E. R. Adair, B.A. (London), M.A. (Cantab), F.R.H.S., Professor of History, McGill University, Montreal, Que.
- Science and the Angler, by V. E. F. Solman, M.A., Ph.D., Limnologist, Dominion Wild Life Service, Department of Mines and Resources, Ottawa.

Children's Lectures

- Holidaying in Canada's National Parks, by Dr. V. E. F. Solman, Department of Mines and Resources.
- Junior Field Naturalists Take Over, by members of the Macoun Field Club, Ottawa.
- Motion Picture Program: The Raider.
- Children's Australia Day—a presentation of the film, Bush Christmas, shown through the courtesy of the Australian High Commissioner, and J. Arthur Rank Films, Ltd.
- Children of Other Lands—France, A Pantomime by Children of the French Embassy (in collaboration with the Citizen's Committee on Children).
- Motion Picture Program: The Enchanted Forest.
- Mother Earth Blows her Top, by Dr. F. J. Alcock, National Museum of Canada, Ottawa.
- Let's Go Fishing, by Dr. A. L. Pritchard, Department of Fisheries, Ottawa.
- Animals and Birds of the Canadian West, by W. E. Godfrey, National Museum of Canada, Ottawa.
- The Loon's Necklace, by Dr. Douglas Leechman, National Museum of Canada, Ottawa.
- Children of Other Lands—India. A Pantomime by Children from India; through the courtesy of the High Commissioner for India (in collaboration with the Citizen's Committee on Children).

Two special features were arranged in addition to the regular series. The excellent program presented by the Marionette Group of the London May Court Club proved extremely interesting and popular. The National Museum gave them all possible aid in the preparation of their feature play, "The Seven Stars", adapted from a Huron legend in the Museum collection. A workshop discussion group held on the evening of October 29, demonstrated the value of the marionette as an educational medium. The complete program presented on the evening of October 30 had an enthusiastic and appreciative audience. Children saw the program on the morning of October 30. Professor William H. Hobbs of Ann Arbor, Michigan, U.S.A., gave two notable lectures on February 18. He chose as his subject for the afternoon lecture, "Polar Mirage and the History of Exploration", and "The Earlier Glaciers of North America" was given to an evening audience.

A special motion picture program introducing "Be Kind to Animals Week" was given on May 1 to pupils of the senior public schools in collaboration with the Ottawa Humane Society.

The assistance of the Boy Scouts and Commissionaires on Saturday mornings in looking after the large number of children who come to the Museum is greatly appreciated by the Lecture Committee.

Particular acknowledgment is made of the co-operation of the local press in reporting the various lectures, and of the Ottawa Public Library in selecting and providing lists of books for supplementary reading related to the lecture topics. Thanks are due also to station CKOY for announcing special lectures on its Town Crier program.

GROUP VISITS

Educational tours of the exhibition halls were arranged for an increasing number of groups from local schools and from localities outside Ottawa. Special shorter tours for primary grades were well patronized also. Senior school groups came from London, Ont., North Bay, Ont., Belleville, Ont., Eganville, Ont., Perth, Ont., Bristol, Que., Poltimore, Que., and other centres.

LECTURE HALL

Scientific and related organizations were granted the use of the Lecture Hall for meetings at which lectures on a wide variety of subjects were given. The reservations numbered 142, and there was a total attendance of 44,075 persons at these meetings.

VISUAL AIDS

Considerable Museum material on anthropology, biology, and other phases of Canada's natural history, went to teachers and others in all parts of the country. Except for cost of transportation one way, this material is lent free of charge to educational institutions in Canada.

PHOTOGRAPHS

Requests for scientific photographs were received from England, the United States, and European countries, as well as from Canada, to illustrate scientific publications, textbooks, and magazine and newspaper articles. Selections were made from the photographic collection to meet these requests.

IDENTIFICATION OF SPECIMENS

Much time was devoted by the Museum staff to the identification of specimens sent in from various parts of the country.

PUBLICATIONS

In addition to its purely scientific publications, the National Museum has issued a considerable number of a more popular nature. There was a greater number of requests for these publications during the year. Many educational institutions have found Museum publications of value, and have encouraged students and others to make full use of a wide selection of this material. Distribution of Museum publications during the year was in excess of 40,000 copies.

ARCHÆOLOGY

Douglas Leechman did field work in archæology from May to September. He first visited a number of amateur collectors on the prairies and examined the sites on which they had been working. He then proceeded to Hazelton, British Columbia, and visited a number of nearby Indian villages. In July and August he worked in the southern Yukon and neighbouring sections of northern British Columbia and southern Alaska. The main purpose of this phase of his field work was to elucidate the old migration routes from Asia into America and to discover, if possible, archæological sites in which cultural material is sufficiently concentrated to make excavation worth while.

Miss Catharine McClellan and Miss Dorothy Rainier made an intensive study of the Interior Tlinkit and of their neighbours of Kutchin origin. They worked with native informants at Carcross, Klukshu, Burwash Landing, and Teslin. They collected a great deal of important information concerning the inter-relation of these two native groups.

In April, Dr. Leechman visited the Rochester Museum and lectured to that organization and the State Archæological Society. In May he attended the annual meeting of the Society for American Archæology in Milwaukee and examined collections in the museum there and nearby archæological sites. In October, he attended the Fourth Iroquois Conference at Salamanca, N.Y.; in December, he attended the annual meeting of the American Anthropological Association in Toronto, and in March 1949, addressed a seminar of the Arctic Institute of North America at McGill University on the subject of the Native Peoples of the Arctic and Sub-Arctic.

In the office, he studied material collected in 1947 during a reconnaissance of the St. Lawrence valley between Cardinal and Cornwall, Ontario, and also from the Parker Site near Campbellford, Ontario. Reports on these two collections were prepared for publication. He continued his work on the study of migration routes, and in this connection examined a collection of specimens from central British Columbia.

Mr. Jean P. Michea carried out field investigations in the northern part of the province of Quebec. This work was done for the National Museum in collaboration with an expedition under the charge of Dr. Jacques Rousseau, Director of the Montreal Botanical Garden. The party

crossed Ungava peninsula from Povungnituk Post on Hudson Bay to Payne River Post on Ungava Bay by following the Kogaluk and Payne Rivers. Mr. Michea discovered a number of interesting Eskimo stone ruins both on the coast and inland. In addition he secured many anthropological specimens and photographs.

Dr. Henry B. Collins of the Bureau of American Ethnology, Smithsonian Institution of Washington, assisted by Colin Thacker of the National Museum staff, carried out anthropological investigations at Frobisher Bay on Baffin Island. The party was flown from Westover to the field and return by United States Air Force through the courtesy of the Chief of the Meteorological Service. Dr. Collins discovered some semi-subterranean houses built of stones, whale bones, and turf. The excavations revealed evidence of Dorset-Thule relationships in a region not previously studied. Measurements and physiological observations were also made on some eighty living adult Eskimos.

Publications

- Old Crow's Village, by Douglas Leechman. *Canadian Geographical Journal*, July 1948.
 McConnell's Long Trek, by Douglas Leechman. *The Beaver*, December 1948.
 Men out of Asia (review), by Douglas Leechman. *The Beaver*, March 1949.
 An Archaeological survey of the north bank of the St. Lawrence River Between Cornwall and Cardinal, Ontario, June 19 to July 11, 1947, by Douglas Leechman and Frederica de Laguna. *National Museum of Canada Annual Report 1947-48*, pp. 23-28.
 The Parker Site, by Douglas Leechman and Frederica de Laguna. *National Museum of Canada Annual Report 1947-48*, pp. 29-30.

Lectures

- Migration routes from Siberia to America. By Douglas Leechman. Rochester Museum of Science, April 14, 1948.
 Archæology on the Prairies. By Douglas Leechman. Swift Current Rotary Club, June 7, 1948.
 Migration routes. By Douglas Leechman. White Horse Kiwanis Club, July 13, 1948.
 Early Man in the Yukon. By Douglas Leechman. Male School Teachers' Club, November 18, 1948.
 Indians in Canada. By Douglas Leechman. Junior Macoun Club, February 5, 1949.
 Indian masks. By Douglas Leechman. National Museum Winter Lectures, February 26, 1949.
 Native Peoples of the Arctic and Sub-Arctic. By Douglas Leechman. Arctic Institute Seminar, March 10, 1949.

Accessions

- Dr. H. S. Bostock*: prepared core of chert from the Yukon.
Mrs. A. F. G. Cadenhead: birch bark canoe.
Clark M. Garber: Kutchin belt from Alaska.
Mr. A. Johns: small archæological collection.
Wilfrid Jury: fish net of willow bark from Mackenzie River.
J. Kelsall: Eskimo skull and mattock blade.
Fr. François Lanoue: ceinture fléchée.
Dr. Douglas Leechman: archaeological collection from the Yukon.
W. G. McClenahan: pottery from Ontario.
Louise Manny: Micmac manuscript from Nova Scotia.
Mrs. Seaholm: copper point from the Yukon.
Miss S. Stewart: Prairie Indian specimens.
Dr. George Turner: archæological collection from Alberta.
Dr. R. T. D. Wickenden: flaked stone specimens.

ETHNOLOGY

Seven parties were sent in the field in the summer of 1948, one to Nova Scotia and six in various parts of Quebec and Ontario. Details of some of the work accomplished, and the results achieved, will appear in bulletins to be published by the National Museum. Preliminary statements are given below and more extended accounts for four parties appear in the present volume under the authors' names.

(a) Marcel Rioux assisted by Maurice Tremblay, professor of sociology at Laval University, and Claire Mathieu of St. Ann's Military Hospital, investigated the small peasant community of Isle-Verte, in the St. Lawrence River, near Rivière-du-Loup, Quebec. Data concerning religion, social organization, economics, lore and learning, ethics, family, kinship, culture change, and social control and other topics were gathered.

(b) Continued research in folk-lore by Miss Helen Creighton covered the southwest end of Nova Scotia, and a most profitable season is reported. The greater part of the season was devoted to the making of phonograph records, a set of which has been deposited in the National Museum collection. Material recorded included folk songs and folk tales, singing games for children, sea chanties, calls for square dances and fiddle tunes, as well as nursery rhymes and old carols. These were in some variety, a number of the tales and songs being recorded in Acadian French, traditional German used in Lunenburg county, English, and Gaelic. When the remaining localities have been visited, all that is best in this part of Nova Scotia will have been explored and recorded before a great deal of this material has been forgotten and disappears. Miss Carmen Roy spent the summer in the Gaspé region, collecting folk tales, folk songs, and data on folk beliefs, medicine, domestic arts, and other topics. Messrs. Lacourcière and Savard continued their research on the folk-lore of Charlevoix county. Miss Madeleine Doyon worked in Beauce county collecting folk-lore materials, especially on popular dances of this region. Mr. François Brassard visited a few localities of Chicoutimi county, Que., and Ontario and collected folk songs and folk-lore material. Mrs. Juliette-Caron-Dupont made a second trip to the Magdalen Islands to gather folk-lore materials. Despite local transportation difficulties she brought back some very valuable material.

Marius Barbeau completed a large monograph on totem poles, on which he had carried out field investigations along the north Pacific coast for many years. This describes well over 400 poles and house posts, most if not all of which are illustrated, comprises about 1,200 typed pages and over 400 plates and figures. In May, Dr. Barbeau visited a few localities in the state of New York and in New England, to give lectures on Canadian folk songs, and to make sure that no important materials on totem poles in the museums had been overlooked. The last lecture in this series was given at the Library of Congress in Washington. Short trips were taken to London, Ontario, and Quebec, in July and early September, in connection with a marionette show of an Indian legend staged under Museum guidance, and to give assistance to some National Museum field workers.

Marcel Rioux, who became a member of the staff of the Division of Anthropology towards the end of 1947, spent his first months of employment classifying various folk-lore collections and preparing himself for his summer field work. In April 1948, he was sent to Montreal to assist the

Montreal Folklore Festivals as a member of the jury. He supervised the work of different parties engaged in ethnological research in the province of Quebec. The winter months were spent working on his field materials; he also classified and catalogued the collections received in the Museum from parties collecting data during the summer months. Mr. Rioux has written a long paper on "The Concepts of Society and Tradition in Folklore Studies", which will appear in the coming issues of the "Journal of American Folklore". Much time was also devoted to correspondence and interviews with persons desirous of obtaining information about ethnological problems.

Mr. A. Pouinard, a French musicologist, worked in the Division of Anthropology from April to September 1948; his research was partly made possible through a grant from the Rockefeller Foundation, and also through the assistance of the National Museum. He transcribed and analysed many folk songs taken from the Museum collections.

The folk-lore collections were greatly increased in 1948. Many folk-lore documents were obtained in local or parish archives, in the study of folk-lore and mythological themes. Many photographs were taken, and others secured by gift or purchase from various museums in Canada and the United States.

Publications

By Marius Barbeau

- Cornelius Kriehoff, in the Canadian Art Series, The Ryerson Press, Toronto.
- L'Arbre des Rêves, Les Editions Lumen, Montreal.
- Mountain Cloud, Quality Press, London, England.
- Trois beaux canards (a reprint from Les Archives de Folklore, Quebec and Montreal).
- Le Rêve de Kamalmouk, Editions Fides, Montreal.
- A Librarian's Contribution to Canadian Culture, in the *Ontario Library Review*, Toronto, Aug. 1948.
- Are the Real Folk Arts and Crafts Dying Out? in *Canadian Art*, winter 1948.
- Boily le Ramancheur, in *Liaison XIII*, Montreal, March 1948.
- Folk Arts as Part of Folklore, reprinted from *The Journal of American Folklore*, April-June 1948.
- Les Le Vasseur, maîtres menuisiers, sculpteurs et statuaires, in *Les Archives de Folklore*, 1948.
- Old Canadian Pottery, in *The Educational Record of the Province of Quebec*, April-June 1948.
- Potiers Canadiens, in *Technique*, Montreal, Sept. 1948.
- The Blind Singer, in *The Dalhousie Review*, Halifax, April 1948.

Lectures

The lectures and addresses given by Marius Barbeau in the course of the year numbered seventy, six at the University of Montreal, to complete a series in Anthropology and folk-lore; and thirty-eight at Laval University, on human geography and on folk songs. The other lectures or addresses were given at Utica and Cooperstown, N.Y., Washington, D.C., Philadelphia, Alleghany State Park (N.Y.), Hudson (Mass.), Toronto, Ottawa, Montreal, and Quebec.

ZOOLOGY

Contributions meriting special mention are caribou material, northern Quebec, Duncan M. Hodgson; 145 birds and mammals, Ungava Bay, Henry Hildebrand; 36 birds and mammals, eastern Arctic, John P. Kelsall, Dominion Wildlife Service; 11 birds, Bayhead, Nova Scotia, Stuart D. MacDonald; Alberta and Saskatchewan mammals, National Parks Service staff.

Staff members W. Earl Godfrey and Stuart D. MacDonald did field work in southwestern and central western Saskatchewan, and Colin L. Thacker on Baffin Island.

Austin W. Cameron joined the staff on November 15, Miss Jean K. Cameron on January 19, and George Blanchard was assigned to the division on December 13.

The exhibition case for a red fox group was completed, and the background painting and fabrication of plant accessories is well under way. A map of Canada, on a 6- by 8-foot panel, to indicate the geographic localities portrayed in the mammal groups, was completed and installed on the wall of the exhibition hall. A definite improvement was made to the entomological display by the acquisition of eight attractive and instructive exhibits from the Division of Entomology, Department of Agriculture. Birds, mammals, and osteological material were prepared for the study collections, and birds for exhibition and for the School Loan collection. A natural history display was installed at the Sportsmen's Show.

Fish models and working space for several weeks were made available for use of a National Film Board artist.

On request for material from Canada, a red-winged blackbird and a chipmunk were presented to Superior Public School of la Villa, Guanajay, Cuba.

Two hundred and fifty-two mammals and birds were supplied from the School Loan collection for use in nature study classes.

Clyde L. Patch, devoted considerable time to supervision and instruction. Amphibians and reptiles were identified, and inquiries regarding herpetology were replied to. A paper on wood-frogs in Canada was written for publication in "Copeia", and some manuscript prepared for a proposed publication on the herpetology of Canada. Descriptions were quoted and photographs of amphibians were supplied for reproduction in "Handbook of Frogs and Toads", by A. H. and A. A. Wright, Comstock Publishing Company. One series of amphibians was loaned to the American Museum of Natural History, and another to the University of Michigan, for study purposes. A miniature grizzly bear was modeled, cast and coloured for display. Specimens were prepared for exhibition, the mammal study collection and the exhibits were maintained, and assistance given on various museum projects.

W. Earl Godfrey continued research on the taxonomy and distribution of the birds of Canada. Particular attention was devoted to certain species such as the Savannah sparrows, olive-backed thrushes, brown creepers, and brown-headed chickadees. A revision of the races of the last species is nearing completion, but material from certain critical localities is still needed. A report on the birds of Lake Mistassini and Lake Alanel, Quebec, was completed and submitted for publication. Work is progressing

on a report on the birds of southwestern and central western Saskatchewan, and work was begun on a popular Museum bulletin which will deal with some of the common birds of Canada. The period May 29 to August 26 was spent in the field, in which time studies were conducted on the birds and mammals of western Saskatchewan. Routine included the ornithology correspondence, supervision of work on the ornithology literature files, and the furnishing of ornithological information, including the identification of specimens, in compliance with numerous requests.

Austin W. Cameron replied to inquiries concerning mammals, and identified material submitted by various individuals and institutions. A method by which the native caribou can be distinguished by skull characters from the closely related introduced reindeer was worked out for use of the Dominion Wildlife Service. The mammal specimens received during the past few years were identified and distributed in the systematic collection. A comprehensive taxonomic study of the mammals of Lake St. John region, Quebec, was completed, and a manuscript prepared for publication. A similar study of the mammals of Lake Mistassini, Quebec, is in progress, and it is expected that the results will be submitted for publication shortly. The card catalogue of mammal specimens in the National collection is being brought up to date.

Claude E. Johnson draughted, coloured and illustrated the 6- by 8-foot map panel now in the exhibition hall, draughted a detailed map of the Lake Mistassini district for reproduction, completed a milk snake and an albino green frog representation for display, and cast and coloured archaeological reproductions. He made field notes and colour sketches for the fox group background on which he is now engaged.

Colin L. Thacker accompanied Dr. Henry B. Collins of the Smithsonian Institution on an expedition to southern Baffin Island, where he assisted in the excavation of two stone dwellings of ancient native people. In the vicinity of the excavations, Mr. Thacker collected fifty-seven plant specimens for the National Herbarium. In the Museum he prepared material for the study and School Loan collections, accessories for the fox group, and assisted on various other projects.

Stuart D. MacDonald accompanied Mr. Godfrey on a biological investigation in Saskatchewan where he collected and prepared birds, mammals, and amphibians for study purposes. In the Museum, he prepared material for the study and School Loan collections, catalogued a considerable number of birds, put the egg collection in American Ornithologists' Union Check-list order, and assisted on various other activities.

Field work on the birds and mammals of western Saskatchewan was conducted by W. Earl Godfrey, assisted by Stuart D. MacDonald, Rodger O. Standfield, and B. C. W. Hummel. In the period June 4 to July 14, work was centred in the ecologically-varied Cypress Hills region where emphasis was placed on the higher parts of the Cypress Hills, although work was done also on the surrounding plains south to the Montana border and north to Crane and Big Stick Lakes. On July 21 camp was set up on the east shore of Flotten Lake in central western Saskatchewan and the area between Flotten Lake and Meadow Lake was studied until September 6. Specimens collected totalled 946 birds, 123 mammals, 9 amphibians, and a small collection of plants for ecological studies. Coloured motion

pictures of some of the birds and mammals were taken. Habitat photographs and detailed notes obtained will furnish the basis for a report on the birds and mammals of the regions investigated.

A considerable number of birds and mammals from the study collections were loaned for examination and comparison to the United States Fish and Wildlife Service, Washington, D.C.; University of Michigan, Ann Arbor, Michigan; Cornell University, Ithaca, New York; Doane College, Crete, Nebraska; Royal Ontario Museum of Zoology, Toronto, Ontario; Museum of Comparative Zoology, Cambridge, Massachusetts; National Research Laboratory, Ottawa, Ontario, and to individuals not associated with public institutions.

Material for taxonomic study was borrowed from the British Columbia Provincial Museum, Victoria, British Columbia; United States National Museum, Washington, District of Columbia; Cleveland Museum of Natural History, Cleveland, Ohio; and from Hoyes Lloyd, Ottawa, Ontario.

Lectures

- Wild Birds and Their Protection. By W. Earl Godfrey. Radio Station CFRA, Ottawa, May 6.
- Saskatchewan Wildlife. By W. Earl Godfrey. Annual Meeting of the Ottawa Field-Naturalists' Club, CFRA Auditorium, Ottawa, December 7.
- Prairie Birds and Mammals. By W. Earl Godfrey. Province of Quebec Society for the Protection of Birds, Mechanic's Hall, Montreal, Quebec.
- Birds and Mammals of Western Canada. By W. Earl Godfrey, Museum Lecture Series, February 19.

Publications

- Mammals of the Eastern Rockies and Western Plains of Canada. By A. L. Rand. National Museum of Canada, Bull. 108, Biol. Ser. 35, pp. i-vii, 1-237, 89 figures.
- Birds of the Lake St. John region, Quebec. By W. Earl Godfrey and A. L. Wilk. National Museum of Canada, Bull. 110, Biol. Ser. 36, pp. 1-32, 1 plate, 1 figure.
- Birds of Southern Alberta. By A. L. Rand. National Museum of Canada, Bull. 111, Biol. Ser. 37, pp. 1-105, 4 plates, 1 figure.
- Stomach Stone in the Muskrat. By A. L. Rand and P. A. Orkin. Canadian Field-Naturalist, vol. 62, No. 1, p. 41.
- Summer Flocking of the Loon, *Gavia immer* (Brun.). By A. L. Rand. Canadian Field-Naturalist, vol. 62, No. 1, pp. 42-43.
- Erroneous Use of the Name 'Red-backed Junco'. By W. Earl Godfrey. Canadian Field-Naturalist, vol. 62, No. 4, p. 124.
- Mr. W. H. Bryenton's Notes on Manitoba Mammals of the Herb Lake-Flin Flon Area. Compiled by A. L. Rand. Canadian Field-Naturalist, vol. 62, No. 5, pp. 140-150.
- Note on the Red Crossbills in the Ottawa District. By A. L. Rand. Canadian Field-Naturalist, vol. 62, No. 5, pp. 162-163.
- Distributional Notes on Canadian Birds. By A. L. Rand. Canadian Field-Naturalist, vol. 62, No. 6, pp. 175-180.
- Probability in Subspecific Identification of Single Specimens. By A. L. Rand. The Auk, vol. 65, No. 3, pp. 416-432.
- Distribution of the Races of the Swamp Sparrow. By W. Earl Godfrey. The Auk, vol. 66, No. 1, pp. 35-38.
- Reviews (10) of Current Literature by A. L. Rand. Canadian Field-Naturalist, vol. 62, pp. 45-46, 77-78, 102.
- Reviews (10) of Current Literature by W. Earl Godfrey. Canadian Field-Naturalist, vol. 62, pp. 45, 77, 101-102; vol. 63, pp. 45-46. Bird-Banding, vol. 19, No. 3, pp. 127-129; vol. 20, No. 1, pp. 61, 72.

Accessions

BIRDS

By Gift:

- Anderson, R. M., Ottawa, Ont.: 9 birds from Jasper National Park, Alberta.
 Baldwin, W. K. W., Ottawa, Ont.: 1 tree swallow.
 Ball, Mrs. Frances, North Bruce, Ont.: 1 whistling swan, head only.
 Blakely, David J., Ottawa, Ont.: 5 birds from Ontario, and 2 from Quebec.
 Bourguignon, A. W., Ottawa, Ont.: 2 scaup ducks, 2 field sparrows, 1 upland plover, 1 pine grosbeak, 1 black tern, 1 evening grosbeak.
 Cleghorn, J. D., Montreal, Que.: 1 ptarmigan.
 Collins, Dianna, Ottawa, Ont.: 1 cedar waxwing.
 Curtis, M. W., Ottawa, Ont.: 1 broad-winged hawk, 1 hooded merganser, 1 mourning dove.
 Davis, Sheldon, Eganville, Ont.: 3 blue jays, 2 mounted for School Loan collection, 1 skin.
 Duchesnay, D. J., Ottawa, Ont.: 1 tree swallow.
 Frith, Rowley, Ottawa, Ont.: 1 yellow rail, remnants of wing and tail.
 Groves, J. W., Ottawa, Ont.: 1 cedar waxwing.
 Hildebrand, Henry, Montreal, Que.: 110 birds from Ungava Bay, Quebec.
 Kelsall, John P., Dominion Wildlife Service, Ottawa, Ont.: 29 birds from eastern Arctic.
 Lawrence, Mrs. Louise de K., Rutherglen, Ont.: 2 nests of the red crossbill.
 Lloyd, Hoyes, Ottawa, Ont.: 6 bird skins for School Loan collection.
 Maison, Miss Ivy, Ottawa, Ont.: 1 barn swallow, 1 hooded merganser.
 MacDonald, Roderick M., Bayhead, N.S.: 1 long-eared owl.
 Miller, D. F., Britannia village, Ont.: 1 saw-whet owl.
 Moffat, Thomas, Ottawa, Ont.: 1 American robin.
 Munro, J. A., Okanagan Landing, B.C. and Ronald W. Stewart, Massett, Queen Charlotte Islands, British Columbia: 1 trumpeter swan.
 Ommanney, G. G., Hudson Heights, Que.: 2 tree swallows, 1 eastern warbling vireo, 1 flicker.
 Posselwhite, G., Billings Bridge, Ont.: 1 grey-cheeked thrush.
 Priem, R. L., Ottawa, Ont.: 1 bald eagle (mounted).
 Royal Canadian Mounted Police, Grande Prairie, Alberta: 1 trumpeter swan.
 Royal Canadian Mounted Police, Ottawa, Ont.: 1 bittern.
 Savile, Douglas B., Ottawa, Ont.: 1 golden-crowned kinglet.
 Shirley, Charles F., Dorintosh, Sask.: 1 magpie.
 Taggart, Jean, Ottawa, Ont.: 1 yellow warbler.
 Vich, A. E., Ottawa, Ont.: 1 wood duck (mounted).
 Whiting, J. E., Bella Coola, British Columbia: 1 starling.
 Wood, Ronald, Ottawa, Ont.: 1 white-throated sparrow.

By Purchase:

- Manning, Thomas H., Ottawa, Ont.: 117 bird skins from Baffin and Southampton Islands; 159 bird skins from Ontario.
 Duncanson, Lloyd, Gaspereau, Nova Scotia: 57 bird skins from Nova Scotia.

By Exchange:

- Zoologisch Museum, Amsterdam, Holland, 3 adult specimens of herring gull, *Larus argentatus argenteus*.

Museum Expedition:

- Godfrey, W. Earl, Stuart D. MacDonald, and Rodger C. Standfield, Museum Expedition to southwestern and central western Saskatchewan, 946 birds, 1 nest of Brewer sparrow.

By Members of Staff:

- Cameron, Austin W., Ottawa, Ont.: 1 Canada jay.
 Godfrey, W. Earl, Ottawa, Ont.: 1 nest of red crossbill.
 MacDonald, Stuart D., Ottawa, Ont.: 14 birds from the Ottawa district, and 11 birds from Bayhead, N.S.
 Patch, Clyde L., Ottawa, Ont.: 1 snow bunting.
 Thacker, Colin L., Ottawa, Ont.: 1 kingfisher, 2 red-winged blackbirds, 1 barn swallow.

AMPHIBIANS AND REPTILES

By Gift:

- Blancy, L. W., Britannia Heights, Ont.: 1.
 Dupuis, Earl, North Low, Que.: 1.
 Hildebrand, H., Chimo, Que.: 18.
 Lockwood, Robert D., Manotick, Ont.: 1.
 Norris-Elye, L. T. S., Winnipeg, Man.: 3.
 Ramsey, Gordon, Wychwood, Que.: 1.
 Stevens, W. E., Mackenzie Delta, N.W.T.: 2.
 Wright, Bruce S., Chimo, Que.: 1.

By Members of Staff:

- Godfrey, W. Earl, Flotten Lake, Sask.: 1.
 Hummel, B. C. W., Flotten Lake, Sask.: 3.
 MacDonald, S. D., Flotten Lake, Sask.: 5.
 Johnson, Claude E., Danford Lake, Que.: 8.

MAMMALS

By Gift:

- Anderson, E. G., McKellar, Ont.: 1 field mouse.
 Anderson, R. M., Ottawa, Ont.: 2 red squirrels.
 Bourguignon, A. E., Ottawa, Ont.: 1 badger.
 Cameron, Austin W., Ottawa, Ont.: 1 coyote, skull only, from Pleasant Hill, N.S.
 Churchman, J. W., Regina, Sask.: 1 caribou skull.
 Farley, Frank, Camrose, Alta.: 2 least weasels.
 Fetherston, Miss K. E., London, Ont.: 1 fox squirrel.
 Fisher, H. D., Dominion Wildlife Service, Ottawa, Ont.: 2 cougars and 2 coyotes from Jasper National Park, Alberta.
 Frith, Rowley, Ottawa, Ont.: 1 star-nosed mole.
 Hemmerich, R. G. Dr., Kitchener, Ont.: 1 Atlantic walrus, skull with supernumerary tusk from Cape Dorset, Baffin Island.
 Hennessey, T. S., Dominion Wildlife Service, Ottawa, Ont.: 1 skunk.
 Hildebrand, Henry, Montreal, Que.: 11 large mammal skulls, 1 salted mammal skin, 23 small mammal skins and skulls from Ungava Bay, Quebec.
 Hodgson, Duncan M., Montreal, Que.: 2 caribou, skulls and pelts, 2 sets detached antlers, 2 skeletons from Ungava Bay, Quebec.
 Jenness, John L., Ottawa, Ont.: 1 white whale, cranium only from northwest coast of Victoria Island, District of Franklin, N.W.T.
 Johnson, Gifford DeC., Ottawa, Ont.: 3 bear skulls, 1 red fox.
 Kelsall, John P., Dominion Wildlife Service, Ottawa, Ont.: 7 mammals, skins and skulls from eastern Arctic.
 Mulligan, R., Ottawa, Ont.: 1 cat skull.
 National Parks Service: 5 wolves and 1 coyote from Prince Albert, Sask.
 Purdy, A. S., St. Michel des Saints, Que.: 2 red squirrels.

By Purchase:

- Baffin Trading Co., Diana Bay, Que.: 1 caribou skull and antler.
 Manning, Thomas H., Ottawa, Ont.: 3 seal skulls and lower jaws; 1 polar bear skull, 2 lemming skins and skulls.

Museum Expedition:

- Godfrey, W. Earl, Stuart D. MacDonald, and B. C. W. Hummel, Museum Expedition to southwestern and central western Saskatchewan, 123 mammals.

By Members of Staff:

- Cameron, Austin W., and Stuart D. MacDonald, 3 white-footed mice and 1 short-tailed shrew from Wakefield, Que.
 Thacker, Colin L., 1 lemming skin and skull from Baffin Island.

NATIONAL HERBARIUM

Field Work

A. E. Porsild, Chief Botanist, made an extended tour of the southwestern United States on special leave during the months of May and June, visiting the principal United States National Parks, botanical collections, etc. Before his return to Ottawa, on July 9, he spent two weeks in British Columbia and Alberta studying the alpine flora, collecting several hundred sheets of plants for the Herbarium.

H. J. Scoggan led a field party during the months of June, July, and August in a survey of the Norway House-Cross Lake and northern Lake Winnipegosis areas of northern Manitoba. About 2,650 numbers of plant specimens resulted from this survey, each representing a collection of six sheets of material. The collections were made to illustrate the various ecological habitats encountered, and photographs were taken to show the general topography and vegetation types.

W. K. W. Baldwin, accompanied by H. L. Shearman of the Museum staff, left Ottawa on September 29 by R.C.A.F. plane for Goose Bay, Labrador, where 5 days were spent in collecting seeds of various tree species following a request from the Danish Forest Service.

J. D. Campbell of Vancouver, from June 2 to Sept. 24, accompanied a geological field party led by Dr. Hugh S. Bostock to Yukon. The field season was spent in the McQuesten district and resulted in a collection of approximately 900 numbers of plants each represented by two sheets of specimens. Copious notes on the vegetation and a 25-page report were submitted at the end of the season.

I. Hustich of Helsingfors, Finland, during the summer of 1948 carried out forest botanical studies in central Ungava sponsored by the Arctic Institute of North America and the National Museum of Canada. A collection of approximately 3,000 plant specimens, including duplicates, resulted from this work. At the conclusion of the season a preliminary report entitled: Forest Botanical Field Work in Ungava, 1948, was submitted by Dr. Hustich.

During the year Mr. Porsild completed the preparation of his report on the flora of southeastern Yukon adjacent to the Canol Road, which is based primarily on field work carried out in 1944. He prepared a 23-page report for publication on a collection of plants from Nuelin Lake, N.W.T., made by Francis Harper, in 1948, aided by a grant from the Arctic Institute of North America. He also prepared a report on collections of *Antennaria* made in Ungava by Dr. Jacques Rousseau in 1947 and 1948 under a similar grant. For the Arctic Institute of North America he edited and rewrote for publication a report by I. Hustich of the Botanical Institute of Helsingfors, Finland, on his Forest Botanical Field Work in Ungava, 1948. He also wrote several book reviews and a number of articles for the "Arctic Circular". He named and reported on a number of collections of plants submitted for determination by the Division of Entomology of the Department of Agriculture; the Dominion Forest Service and the National Parks Service of the Department of Mines and Resources; the University of

Montreal; McGill University; Ecole d'Agriculture, Rimouski, Que.; and Institut Agricole d'Oka, La Trappe, Que. He also named approximately half of the 800-odd numbers of plants collected in Yukon by J. D. Campbell, who accompanied Dr. H. S. Bostock in 1948, and checked critical material in the collections resulting from H. J. Scoggan's 1948 field work in Manitoba. He checked mounted specimens before insertion in the National Herbarium, selected loan material requested for study by various specialists in Canadian and foreign botanical institutions, and with W. K. W. Baldwin made up six sets of plants, totalling 2,041 duplicate specimens, resulting from the 1947 National Museum botanical expedition to James Bay.

H. J. Scoggan worked on the final revision of the typescript of his *Flora of the Gaspé Peninsula, Que.*, comprising about 660 pages. He prepared a paper on the Gaspé Flora, which A. E. Porsild presented at the annual session of the Royal Society of Canada held in Vancouver. He also prepared his private collection of 2,000 specimens of the rarer and more interesting elements of the Gaspé flora for donation to the National Herbarium. He named the 2,650 numbers of plant specimens collected during the summer, representing 561 separate entities, and arranged them for mounting and exchange. He prepared a 16-page report on plants collected by Dr. A. G. Huntsman on both sides of the Strait of Belle Isle and Cabot Strait.

W. K. W. Baldwin wrote a summary report of the 1947 James Bay-Hudson Bay expedition for publication in the National Museum Annual Report. He represented the National Museum at the Boston meeting of the American Association of Museums, May 27-29, and on his return submitted a written report of the meeting. He gave a quarter hour broadcast on Museum activities on the C.B.C. Overseas Service. Throughout the year, he carried out the routine work of arranging, sorting, and inserting specimens, making up sets of duplicates for exchange, checking camp equipment, and preparing for the 1949 work in the field.

On November 1, Miss Barbara Schwartz was appointed Museum assistant in the National Herbarium.

Accessions, Loans, and Exchanges

During the year 5,511 herbarium specimens were received by exchange, 2,065 by donation, and approximately 11,400 specimens resulted from field work by members of the National Herbarium staff. Five hundred and twenty-four specimens were loaned to and 16 specimens were borrowed from other botanical institutions. Five thousand eight hundred and forty duplicate specimens were distributed to other herbaria in Canada and abroad in continuation of exchanges. Fifty-one packets of seeds from Goose Bay were sent, as a gift, to the Forest Genetic Laboratory, Copenhagen, Denmark, for use in afforestation work in South Greenland. In addition, 5 packets were sent to Dr. C. Heimburger for experimental work at the Southern Experiment Station, Maple, Ont. Nine thousand two hundred and twenty-five specimens were mounted and inserted in the Herbarium, bringing the total of numbered specimens in the National collection to 198,345.

The National Museum gratefully acknowledges the generous donations of the following collections:

- R. M. Anderson, Ottawa, plants of New Brunswick, 10.
 C. Thacker, Ottawa, plants of Baffin Island, 58.
 J. A. Munroe, Okanagan Landing, plants of British Columbia, 2.
 G. H. Turner, Fort Saskatchewan, Alta., plants of Alberta, 119.
 H. H. Aimé, Ottawa, plants of Ellesmere Island, 11.
 Rev. E. Lepage, Rimouski, Que., plants of Alaska, 82.
 J. P. Kelsall, Ottawa, plants of Ellesmere Island, 29.
 A. W. F. Banfield, Ottawa, plants of Northwest Territories, 23.
 A. G. Huntsman, Toronto, Ont., plants of Strait of Belle Isle, 1,500 (app.).
 Dr. Francis Harper, Mount Holly, N.J., plants from Nueltin Lake, N.W.T., 255.
 Royal Canadian Mounted Police, Ottawa, sclerotium of *Polyporus tuberaster*, 1.
 F. Brown, Metcalfe, Ont., sclerotium of *Polyporus tuberaster* from Saskatchewan, 1.

Publications

The following articles were published by the staff of the National Herbarium during the year:

- Greenland at the Crossroads. By A. E. Porsild. Arctic Vol. 1, No. 1: 53-57 (5 pages) (1948).
 McClintock's Telescope and Books. By A. E. Porsild. Arctic Circular 1: 41-42 (1948).
 Greenland's Five-year Plan. By A. E. Porsild. Arctic Circular 1: 65-67 (1948).
 Lead Discoveries in Greenland. By A. E. Porsild. Arctic Circular 1: 81 (1948).
 Afforestation Experiments in Greenland. By A. E. Porsild. Arctic Circular 2: 1-3 (1949).
 The Changing Climate of the Arctic. By A. E. Porsild. Arctic Circular 2: 3-5 (1949).
 Families of Flowering Plants. By H. J. Scoggan. Canadian Nature, May-June: 102-105 (1948); Sept.-Oct.: 134-137 (1948).
 Pioneer Plants. By H. J. Scoggan. Canadian Nature, Jan.-Feb.: 22-25 (1949).
 East Coast of James Bay and Hudson Bay. By W. K. W. Baldwin. Arctic Circular 1: 23-24 (1948).

Lectures

- The Flora of the Gaspé Peninsula and Bic, Que. By H. J. Scoggan, presented by A. E. Porsild. The Royal Society of Canada, June 15, at Vancouver.
 The Canadian Exhibition. By W. K. W. Baldwin. American Association of Museums, May 28, at Boston.

Visitors

During the year 159 visitors from Canada and abroad visited the National Herbarium for shorter or longer periods for the purpose of examining specimens or for consultation with members of the staff.

Those conducting more extensive researches were:

- Dr. Hugh M. Raup, Director of Harvard Forest of Harvard University, visited the the National Herbarium from April 10-18 in preparation for his expedition to Yukon.
 Dr. I. Hustich of the University of Helsingfors, Finland, worked on his Ungava collection from September 9-13, inclusive.
 Messrs. H. Shacklette and L. Jordal of the University of Michigan, Ann Arbor, from January 23-27, inclusive, worked on a collection of plants from Bear Lake.

VERTEBRATE PALÆONTOLOGY

The Vertebrate Palæontology staff was transferred from the Geological Survey to the National Museum, and a museum assistant, H. L. Shearman, was added to the staff, late in the year.

C. M. Sternberg, aside from routine duties and identification of specimens sent in, continued his studies of the dinosaur collection. A scale model was made to illustrate the type skull of the thick-nosed dinosaur and the description of this new family was completed. Progress was made on the preparation and study of the small, primitive horned dinosaurs. Mr. Sternberg led a party to the Wapiti Lake district of British Columbia to collect Triassic fish fossils.

J. Skillen completed preparation of the thick-nosed dinosaur and made progress in the preparation of the two little horned-dinosaur skeletons.

H. L. Shearman assisted in general work and began preparation of a Cretaceous turtle.

Lectures

Canadian Dinosaurs, by C. M. Sternberg, Radio Station CKCO, Ottawa, Nov. 28, 1948.

Dinosaurs of Prehistoric Canada, by C. M. Sternberg and W. A. Bell. Interviewed by Percy Newman, Radio Station CBO, Ottawa, Jan. 9, 1949.

Publication

Canadian Dinosaurs, by C. M. Sternberg, Professional Institute Journal for Dec. 1948.

Accessions

Skull and partial skeleton of White Whale.

Collections of Triassic fishes from Wapiti Lake, B.C.

EXCAVATIONS AT FROBISHER BAY, BAFFIN ISLAND, NORTHWEST TERRITORIES

(Preliminary Report)

By Henry B. Collins

In the summer of 1948, at the invitation of the National Museum of Canada, the writer conducted excavations at Frobisher Bay, Baffin Island, and obtained interesting evidence of the relationship of the Dorset and Thule cultures in this archæologically unknown area. The original plan as initiated by Dr. Diamond Jenness, then Chief of the Geographical Bureau of the Department of Mines and Resources, and Dr. F. J. Alcock, Chief Curator of the National Museum, had been for me and my assistant, Mr. Colin Thacker, to be flown to Resolute Bay, Cornwallis Island, to excavate Eskimo ruins in the vicinity of the newly established weather station. When we arrived at Goose Bay, Labrador, we learned that flights to Resolute Bay were postponed for an indefinite period because of repairs being made on the air strip there. In view of this situation we arranged to go up to the Baffin Island Air Base, Crystal II, at the head of Frobisher Bay, where we could stay while awaiting transportation to Cornwallis Island. In this way I hoped to be able to make physical measurements on the Eskimos who lived near the Base and also locate some old Eskimo house ruins near the mouth of Sylvia Grinnell River reported by Charles Francis Hall in 1865.

Mr. Thacker and I arrived at Frobisher Bay, July 10. A month later there was an opportunity to fly up to Cornwallis Island, but by that time it seemed best to remain at Frobisher Bay and finish the work then under way. The excavations from July 17 to August 21 yielded over 600 artifacts, representative types of which are illustrated on Plates V to X. Physical measurements and photographs were also made of 80 adult Eskimos, 40 males and 40 females. When study of the archæological material is completed, the collection is to be divided equally between the two sponsoring institutions, the National Museum of Canada and the Smithsonian Institution.

HOUSE RUINS

About $\frac{3}{4}$ mile above the mouth of Sylvia Grinnell River, 2 miles to the west of the Air Base, we found the ruins of the three underground houses mentioned by Hall (1865, II, p. 111). The houses occupied an elevated grassy area between two large rock ledges 140 to 200 feet from the east bank of the river. The site, which will be referred to as Crystal II, was about 12 feet above high tide level; at low tide the outer rock ledge appeared as an almost vertical cliff rising 50 feet above the water. An opening in the rock ledge forms a gorge, giving an easy approach to the river at low tide. At high tide it becomes a little cove, which would have been a convenient place for launching kayaks.

In the immediate vicinity of the house ruins were several old stone tent rings and caches. Stone structures of this kind are very common in Frobisher Bay. Along the lower course of the river there was hardly a level space anywhere that did not have a tent ring or cache. Some of them—circular rows of single, relatively small stones—had been used as

tent sites within the past decade. Others were formed by large, closely spaced boulders, partly embedded in the ground; these were covered with a dense growth of lichens and were obviously much more ancient. They seemed to have been the foundations for oval or rectangular structures of a somewhat more permanent nature. Like the present Central Eskimo qarmat, or autumn house, they probably had stone and turf walls and a skin roof. We excavated several of these stone enclosures and tested others but with negative results, not a single artifact being found.

Two of the three underground houses had already been excavated. As I found out later, the largest of them—House 2, which had three sleeping platforms—had been worked in 1943 by Lt. Willie Knutsen when he was stationed at the Air Base. The other, which we called House 1, had been excavated by soldiers at the Base after Lt. Knutsen's departure.

Houses 1 and 2. As these two houses had already been excavated, we limited our work mainly to adjacent midden areas. In front of House 1 excavations over an area of about 25 by 18 feet revealed a complex array of stones, some of which were part of the entrance passage and others parts of fireplaces and a circular stone-floored cache. Artifacts from these areas numbered over 100.

House 3. This house had not been disturbed. Its presence was indicated by a shallow sunken area with a number of partly buried stones. It was covered with a dense tough mat of vegetation 6 to 12 inches thick, consisting mostly of ground willows and other low growing plants, mosses, and grasses. There was a marked contrast between this vegetation and the lush, tall grass around Houses 1 and 2, growing on soil thrown out when the houses were excavated in 1943.

House 3 was oval to rectangular in outline, 12 feet long by 10 feet 9 inches wide (Plate II). It was entered by a sunken passageway 9 feet long by 3 feet wide, with a maximum depth of 4 feet; like those of all the other houses, the passage faced northwest, toward the river. The house floor, 26 to 33 inches below the surface, was of carefully laid flat stone slabs. At the rear was a sleeping platform 80 inches wide and 16 inches high made of six large flat slabs resting on stone uprights. The walls had been made of stones, a few whale bones, and possibly turf. The roof had consisted of flat stones and whale ribs and scapulæ, which had fallen to the floor, and there probably had been a surface covering of turf. The entrance passage had likewise been roofed with whale ribs and stones. The builders had not had to lay a stone floor for the passage, but had used the sloping surface of a buried rock ledge.

About 100 artifacts were found in or immediately adjacent to House 3. Diagnostic types found inside the house and passage were all Thule. A few Dorset implements were found just outside the walls of the house and passage.

House 4. One hundred and sixty feet downstream from House 3 we found a fourth house ruin. It was scarcely visible, consisting only of a slight depression and two stones and the tip of a whale skull, all lichen covered, protruding slightly above the surface (Plate III). The dense mat of vegetation over it differed in no way from that covering the surrounding terrain. This house was not so well preserved as House 3, and surrounding it were many rocks, the function of which was not clear. The floor was

formed of flat stones of varying sizes, laid with some regularity (Plate IV). The floor area was roughly rectangular, 8 feet long by 5 feet wide. At the rear was the fallen sleeping platform. There was no trace of roofing materials. The entrance passage faced northwest, but its outlines could not be traced with certainty, and the same was true of the house walls. The absence of any whale ribs and the relative scarcity of stones inside the house proper, suggested the possibility that bones and stones from it may have been removed to build some of the other houses. Just outside the house were two rather well preserved caches that contained considerable refuse. In one of them, placed nose downward, lay the whale skull already mentioned. When the work was completed we had excavated a total area of about 45 by 35 feet. Here as elsewhere permafrost was found usually less than a foot deep.

Outside the house, toward the south and west, was found an old sod line, a buried layer of vegetation consisting mostly of sphagnum moss, cassiope, and willow. It continued as an unbroken stratum 2 to 5 inches thick to the edge of the excavation, at an average depth of 15 inches. Black soil strata containing refuse and artifacts were found both above and below the old sod line. An important clue to the relative age of the cultural material was that most of the Dorset objects were found below the old sod line and Thule objects above it. A total of around 400 specimens was found in and around House 4. Objects from inside the house itself were all Thule, with the exception of one Dorset harpoon head found beneath the stones that supported the sleeping platform.

DORSET CULTURE

Harpoon Heads. Twenty Dorset harpoon heads were found. For convenience in referring to the specimens it may be well to give here a classification of the known types, based on examination of the large collections in the National Museum of Canada, on the present collection, and on published descriptions. In this way it can be seen at a glance which of the known types of Dorset heads are present in our collection and which are absent.

OPEN SOCKET

- A. Line hole at edge
 - (a) Single spur (Plate V, figures 1-3)
 - (b) Bifurcated spur
- B-1. Line hole at centre, above the socket
 - (a) Single spur
 - (b) Bifurcated spur (Plate V, figure 4)
- B-2. Line hole at centre, inside the socket
 - (a) Single spur
 - (b) Bifurcated spur (Plate V, figure 5)

CLOSED RECTANGULAR SOCKET

- A. Single line hole
 - (a) With blade
 - (b) No blade (Plate V, figures 7, 8)
- B-1. Double line holes, at right angle to socket
 - (a) With blade
 - (b) No blade (Plate V, figure 6)
- B 2. Single line hole, parallel to socket
 - (a) With blade

Open socket type A(*a*)—line hole at edge; single spur. There were four of this type: Plate V, figures 1 and 2, ivory; figure 3, antler; and another, not illustrated, of ivory, found outside wall of House 3, depth 18 inches.

Open socket type B-1(*b*)—line hole at centre, above the socket; bifurcated spur. One example (Plate V, figure 4), ivory.

Open socket type B-2(*b*)—line hole at centre, inside the socket; bifurcated spur. One example (Plate V, figure 5), antler.

Closed rectangular socket type A(*b*)—Single line hole; no blade. The majority of the Dorset harpoon heads (11 examples) were of this very small, simple type: Plate V, figures 7 and 8, ivory, and nine other examples, mostly broken and all badly weathered, found in the areas adjacent to House 4 at depths of 10, 15, 16, 18, 20, 23 (2), and 24 (2) inches.

Closed rectangular socket type B-1(*b*)—Double line hole, at right angles to socket; no blade. Three examples: Plate V, figure 6, ivory; the second, not illustrated, antler, was found beside a stone forming the upper part of entrance passage of House 3, depth 3 inches; the third, also of antler, came from west of House 4, depth 12 inches.

It is of interest that no examples of closed socket type B-2(*a*) were found. This is a larger, heavier, and thicker form in which the line hole is cut through the thickened body parallel with the long axis of the rectangular socket. This type, which has been described from other Dorset sites (Jenness, 1928, Figure I, i, j, k; Rowley, 1940, Figure 3, b; Holtved, 1944, Plate 1, figure 7), is, I think, later than the other Dorset types, having developed from Closed socket type B-1(*a*), a thinner form in which the two line holes ran directly through at right angles to the socket. In turn, this late Dorset type B-2(*a*) gave rise to one of the most important modern harpoon types of the Central regions and Greenland, the form which has a bifurcated spur, a thickened body, and a line hole with both openings on the same side—in short, which differs from its Dorset prototype only in having a round instead of a rectangular enclosed socket (Collins, 1937, p. 315).

Harpoon Foreshaft. Plate VI, figure 1, is presumably a Dorset harpoon foreshaft though unlike any previously described. It is of antler with a rounded tang and a flattened tip 6 mm. wide and 3 mm. thick. The line had been fastened above the tang where a series of transverse notches were cut all around.

Knife Handles. The two bone knife handles shown on Plate VII, figures 1 and 2, are somewhat more carefully made than most Dorset handles. Both have the characteristic long deep blade socket and one has a hole cut opposite the lower end of the socket. Both have a hole in the tang, for suspension. The tapering tang of figure 2 is unique.

Miscellaneous Dorset. Plate VIII, figure 1, is a spatulate shaped ivory implement, decorated in characteristic Dorset style, similar to several from Inuarfigssuak, NW. Greenland, described by Holtved (1944, I, Plate 1, figures 21-24). The flattened lower end is thin and sharp. On the under side is a deep median groove, and 1.6 cm. from the upper end is a transverse slot, evidently for a suspension cord. The upper end is carved

to represent an animal's head. The function of these Dorset spatulas is uncertain; the best explanation perhaps is that they were marrow extractors.

The ivory sliver with a neatly carved polar bear head at one end (Plate VIII, figure 11) is almost certainly Dorset. Except for the carved end, the object is unworked.

THULE CULTURE

Except for stone implements—which are described separately—the great bulk of the material from the Crystal II site is Thule.

Harpoon Heads. Nineteen Thule type harpoon heads were found. In contrast to the Dorset heads, all of which were found outside the houses (except Plate V, figure 3, which lay beneath the stones supporting the platform), the Thule heads are definitely associated with the houses, two being found inside House 3 and two (Plate V, figures 10 and 17) inside House 4. Six of the Thule heads are of ivory, 13 of antler. As a group they closely resemble the heads from other Thule sites in the eastern Arctic and those of the contemporaneous Thule-Punuk stage in Alaska.

The one example of Mathiassen's Thule Type 1 (Plate V, figure 17) finds its closest counterpart at Naujan, Repulse Bay (Mathiassen, 1927, I, Plate 1, figure 1). The barbed forms, Thule Type 2, with lashing slots instead of drilled holes, are closest to those from Alaska, Naujan, and Inglefield Land, NW. Greenland (Holtved, 1944, I, Plate 3). Three of the harpoon heads had drilled holes for the lashing (Plate V, figure 15, one other found in front of House 1, and another from inside House 3—all Thule Type 2). Drilled lashing holes are later than slots, the technique having been developed by the Thule Eskimos after their arrival in the East. In Alaska, drilled lashing holes and rivet holes for the blade are found only on harpoon heads of the modern and protohistoric periods, indicating that they were introduced by a late return migration of Thule people. The heads with drilled lashing holes in the present collection are closely comparable to those from Naujan and other Canadian Thule sites and from Inglefield Land and the Thule district in Greenland.

Three of the harpoon heads of Mathiassen's Thule Type 3 (Plate V, figures 11-13) are very much like those from Naujan, where this type of Thule head retains the appearance of its Alaskan prototype (Open socket Type III (a) x—Collins, 1937, page 312) more than do those from other Canadian Thule sites. It is of interest in this connection that our fourth harpoon head of this type (Plate V, figure 16) with its curving contours, is actually closer to early Punuk forms on St. Lawrence Island, Alaska (e.g. Collins, 1937, Plate 28, figure 11) than to any from eastern Thule sites. The closed socket head shown on Plate V, figure 18, is another type that is common in early Punuk times in Alaska (Collins, 1937, Plate 28, figures 25-27) and which occurs as a minority type at the older eastern Thule sites (Mathiassen 1927, I, Plate 2, figure 1, Naujan; Holtved, 1944, Plate 4, figures 9-11, Inglefield Land).

To summarize, the harpoon heads place the Crystal II site with the oldest known eastern Thule sites, Naujan in Repulse Bay and Inuarfigssuaq in Inglefield Land. And the absence of drilled lashing holes at House 4 (if not accidental) would suggest that this part of the site antedated Naujan and Inuarfigssuaq.

Harpoon Parts. Plate VI, figure 2, is an ivory foreshaft, its round tip designed for use with a closed socket harpoon head. Other Thule type harpoon parts are the large antler socket piece, Plate VI, figure 3, with deep bifurcated tang and a wide hole for the foreshaft; the ivory and antler ice picks, Plate VI, figures 4, 5; and the float mouthpiece, figure 7.

Hunting Implements. Plate VI, figure 9, is a small lance head of antler with a bone rivet for holding the blade in place. A bird dart side prong and broken centre prong are shown on Plate VI, figures 10 and 12. The arrow heads (Plate VI, figures 11, 13-16) conform closely to Thule types, especially as represented at Naujan and Inuarfigssuaq. Plate VI, figures 17 and 18 are bone braces for the compound bow. Plate VI, figure 6, is a bone fish lure, and figure 8, a bola weight made of whale bone.

Knife Handles. Representative knife handles are illustrated on Plate VII, figures 4-7. Most of them, like figure 5, are made of antler with a socket for an end blade. Figure 4 has a narrow socket for a side blade at the end. The second main type (Plate VII, figures 6 and 7, both ivory) is the whittling knife, a compound type consisting of two pieces which were fitted together to enclose a small blade, usually of iron, set in the end. Figure 16 was originally a knife handle of this type, later converted into a drill point. Figures 6 and 7, although generally similar to those from other eastern Thule sites, are identical with those from Alaska.

The small bone object shown on Plate VII, figure 3, is questionable both as to function and age. It could have been the tip of a small knife (or projectile?). The slot for a side blade is suggestive of Dorset, but it seems too narrow to have held a stone blade.

Only one ulu handle was found (Plate VII, figure 8). The thickened overhanging grip is a feature that seems to have developed after the Thule culture reached Canada; the earlier Alaskan handles are plain with a straight base and a slightly rounded top.

Scrapers. The two principal types of scrapers are shown on Plate VII, figures 10 and 15. The first (figure 10) is made from a caribou cannon bone, the other (figure 15) from the proximal end of a scapula.

Plate VII, figure 9, is part of a cylinder made of antler, with a sharpened upper end and a groove for the lashing that held the two or more pieces together. This implement, which is tentatively identified as a scraper, is identical with a type from the Thule-Punuk site of Kurigitavik, at Cape Prince of Wales, Alaska.

Drills. A caribou astragalus drill rest is shown on Plate VII, figure 11, and a slender wooden drill shaft and bone drill point in figures 12 and 16. Figure 16 was originally a compound knife handle.

Adze Heads. Adze heads were of the Thule type with narrowed tang, a socket for the blade, and drilled holes for lashing on the handle.

Snow Knives. One complete snow knife, of whale rib, and several fragments of bone and ivory were found. Plate VII, figure 13, of bone, is a snow knife handle.

Sled Parts. Plate VIII, figures 2 and 3, are trace buckles of bone and ivory, respectively. Parts of bone and ivory sled runners and shoes were also found.

Utensils. A wooden dish bottom is shown on Plate VIII, figure 19. The ivory object with line and spur decoration (Plate VIII, figure 17) was probably a box or pail handle.

Steatite Vessels. Soapstone cooking pots were represented by several sherds (Plate VIII, figure 20). These might have been either Dorset or Thule.

Pottery. Several sherds of earthenware vessels were also found (Plate VIII, figure 21). This discovery extends the range of earthenware pottery a considerable distance east and south of its former known limits in the North—Malerualik on Prince William Island and Naujan on Melville Peninsula (Mathiassen, 1927, II, page 105).

Ornaments. On Plate VIII, figures 5-9, are shown several pendants made of ivory and fox teeth. Plate VIII, figure 10, is part of a bone brow band. Figure 12 is a small ivory seal carving and figure 13 a flat-based ivory object of unknown use. Numerous pieces of worked mica, similar to figure 16, were found.

Miscellaneous. An ivory comb is illustrated on Plate VIII, figure 4; the simple decoration is repeated on the other side. Figure 15 is one bird bone inserted in another, a diagnostic Thule element, common to Alaska and the Central regions. Plate VIII, figure 14, is an object of uncertain use; the gouged holes and simple 3-line decoration at one end suggest the possibility of Dorset origin. Figure 18 is a toy, of baleen.

Other objects found but not illustrated include awls, reamers, scrapers, scraper handles, marline spikes, wedges, whale rib picks, mattocks and handles, sled runners and shoes, cutting board, wooden shafts, pieces of baleen, etc.

STONE IMPLEMENTS

One of the most striking features of the Crystal II site was the large number of chipped stone implements and the paucity of rubbed slate. Over 200 chipped stone blades were found, not including innumerable chips and flakes. The majority of them are from the vicinity of House 4. Relatively few were found inside the two houses. Except for some blades of quartzite or crystal, the chipped implements were mostly of one material, a whitish grey chert. With few exceptions the chipped chert implements are typical Dorset forms.

Triangular Blades. The very small triangular blades with flat or concave bases (Plate IX, figures 1-4) are familiar Dorset types. Most of them are beautifully chipped, with fine serrated edges. They could have been either arrow or harpoon blades, though it is to be noted that none of the 20 Dorset harpoon heads had blade slits, nor were any recognizable Dorset arrowheads or parts of bows found. Somewhat more numerous is another characteristic Dorset type, the large triangular blade with deeply concave base (Plate IX, figures 5, 6); only two had side notches above the tang (figure 7). Figure 8 is a straight-based, heavy, triangular blade.

Tanged Blades. There were comparatively few tanged symmetrical blades for knives or projectiles such as shown on Plate IX, figures 9-11.

Plate IX, figures 11 and 12, are flakes, with the under side chipped only along the edges. All the side and end scrapers and many of the knives, described below, are also flakes, some of them quite large and thick, with the smooth concave under surface left plain and the convex upper surface

chipped. Of the chipped blades and scrapers illustrated on Plate IX all are in the flake category except the following, which are chipped on both sides; figures 1-10, 13, 14, 16-18, 23, 24, 29, 30, 35, 36.

Tanged and Notched Knife Blades. (Plate IX, figures 13-23). These characteristic Dorset knife blades were found in considerable numbers at Crystal II. The tang may be long and straight (figures 13, 14), short and wide (figure 15), notched and wide (figures 16-18), or notched and constricted (figures 19-22). The blade is always asymmetrical, sometimes with one edge at a sharp angle (figures 13-15). Like those described by Leechman from Dorset sites on the south side of Hudson Strait, the angle of offset is usually around 45 degrees (Leechman, 1943, page 370, Plate 29, B, 7). Other knife blades of this group have a pointed or more rounded tip (figures 16-23). In addition to being present at all known Dorset sites, the knife blades of the kinds here described are also reported from sites of unknown age in Disko Bay, Greenland (Solberg, 1907, Plate 3). The presence of these and a number of other typical Dorset stone implements in Disko Bay suggests that a definite Dorset period, preceding the Thule, will eventually be established for West Greenland (Collins, 1937, page 336; 1940, page 569).

Side Scrapers. (Plate IX, figures 25-28). These are flakes with retouched edges. On figures 25 and 26 the chipping is heavy and was applied to all edges. Others, like figures 27 and 28, are thin, casual flakes, unmodified except for very fine chipping usually along one edge only.

Flaked Blades. (Plate IX, figures 24, 29, 30). These three blades, rounded, lanceolate, and triangular in outline, are chipped on both sides. Figure 30 is no doubt a knife blade, the others uncertain.

Small Curved Knife Blades. (Plate IX, figures 31-34). Figure 32 and to a lesser extent figures 33 and 34 might be considered as small slender variants of such knives as figures 15-18. They have well-defined notched tangs and figures 33 and 34 have incurving sides. Figure 31, though differing in shape and lacking a true tang, was probably used in the same way. This type of implement (figure 31) has been described from Dorset sites in Newfoundland and Hudson Strait by Wintemberg (1939, Plate 6, figures 33, 34) and Leechman (1943, Plate 29, B, 6). It occurs in Inglefield Land, NW. Greenland (Holtved, 1944, Plate 2, figure 20), and is even more common in Disko Bay where it is represented by a number of variant forms (Solberg, 1907, Plate 2). Finally, it is also a type known from the Old Bering Sea culture on St. Lawrence Island, Alaska (Collins, 1937, Plate 41, figures 22, 23). Figures 35 and 36 are small knife blades with straighter sides.

Lamellar Flakes. (Plate IX, figures 37, 38). This characteristic Dorset element was represented by only a few examples. One end of the longer flake, figure 38, has been carefully chipped.

Burin-like Implements. (Plate IX, figures 39-43). One of the most typical of all Dorset implements, these small blades were usually first chipped and then ground along the edges and sides. They are usually made from the harder varieties of stone. Leechman (1943, page 371) remarks that "those of nephrite are often ground on all faces and edges, resulting in a 'machined' appearance, while those of chert are usually only

partially rubbed after chipping". This applies to the present specimens: Figure 39 is of quartz, the entire surface rubbed smooth, the upper corner made into a cutting edge; figure 43 is of nephrite and figure 41 of a brownish chert, both with all surfaces ground smooth; figures 40 and 42 are of grey chert, and only partly rubbed. Similar implements, of slate, occur in the Old Bering Sea culture (Collins, 1937, Plate 39, figures 19-22). Though such implements are sometimes described as bootsole creasers, it seems more likely that they were used as burins, for fine cutting on bone and ivory, as de Laguna has suggested (1947, p. 193).

Scrapers. (Plate X, figures 1-17). A considerable number of scrapers of different sizes and shapes were found. The larger ones had either a long tang or were notched at the base. The smaller thumb-nail scrapers included some that were quite minute. Some of the smaller scrapers were made of translucent rock crystal (figures 9-11).

Slate Implements. The only slate blades were the two shown on Plate X, figures 18 and 19, fragments of four other rubbed blades, and two unfinished chipped blades. Even more remarkable is the fact that the entire site yielded less than a dozen additional pieces of raw slate or rejectage. The long knife blade (figure 18) is more like those found in Alaska than at eastern Thule sites, though the notched tang suggests a Dorset origin. Figure 23 is one of eight whetstones made of slate.

Nephrite. Plate X, figure 21, is a nephrite adze blade. Its bright green colour and form so closely resemble Alaskan adze blades that it might be regarded as an import and thus be assigned to the Thule occupancy. On the other hand, it could be Dorset for both Jenness (1925, figure 4, c) and Wintenberg (1940, Plate 16, figures 1, 15) have described nephrite adze blades from Dorset sites.

Plate X, figure 20, is a small piece of plagioclase feldspar notched at one edge and smoothed on one side.

An adze blade made of diabase is shown in figure 22.

The abundance of chipped stone implements at Crystal II and the scarcity of rubbed slate raise several interesting problems. If this were a pure Dorset site there would be nothing surprising in this situation, for most of the chipped blades are familiar Dorset types. But, as we have seen, the bulk of the non-lithic material is Thule and the houses themselves are typically Thule. However, a typical Alaskan or Canadian Thule site—even one as small as this—would yield large numbers of rubbed slate blades and quantities of slate rejectage. The virtual absence of slate here means either that the Thule people at Crystal II used Dorset type chipped stone blades for their weapons and implements, possibly because slate was difficult to obtain locally, or that they used metal, which has not been preserved. If the latter, it would mean that the situation here was comparable to that in NW. Greenland where in the Thule stage, stone blades had already been replaced by iron.¹

¹ Holtved's two seasons of excavation in the Thule district and Inglefield Land yielded over 12,000 specimens, but there were very few stone blades—far fewer than we got at the small Crystal II site. Moreover, almost all of those found by Holtved were Dorset types, attributable to the Dorset phase which he discovered in Inglefield Land. As for the Thule people, they had used metal almost exclusively and many of the harpoon heads, knives, and other tools had the iron blades still in place. Analysis showed that the iron was not meteoric, like that used by the Cape York Eskimos, but forged telluric iron. Holtved thinks that the source of the iron was Norse, which would mean that if the 12th century date assigned to the Thule stage in Inglefield Land is correct, Norse influence had extended much farther north and Eskimo-Norse contacts established much earlier than had previously been assumed.

The depths and locations at which the chipped chert artifacts were found may provide a clue as to whether some of them may have been used by the Thule inhabitants. Similarly, to determine whether iron was used we may examine the form of the blade sockets, as no actual metal blades or fragments were found.

Without going into details here, we may observe first that very few chipped stone artifacts were found inside the houses. Outside the houses, however, some of each type were found in the upper levels, though not as many as in the lower levels. These could either have been Dorset specimens that had been displaced or implements actually used by the Thule people. The burin-like implements (Plate IX, figures 39-43) are the only ones that were all found in the lower levels. As far as the distribution is concerned, therefore, we can only say that the Thule people might have used some of the Dorset implements.

The kind of blade slits and sockets on the implements is more enlightening. The blade slits on the two Thule harpoon heads shown on Plate V, figures 11 and 12, are so wide that they could only have held a thick chipped blade. Figures 13, 16, 18, and one not illustrated from House 3, have blade slits that are somewhat narrow for chipped stone blades but too wide for metal; for these, rubbed slate would have been more suitable. In short, none of the harpoon heads seem to have had metal blades.

The knife handles tell a different story. The sockets on the handles illustrated on Plate VII, figures 4 and 8, are so narrow that they could only have held metal blades. Compound whittling knives like Plate VII, figures 6 and 7, always had iron blades, even in Alaska where the type originated.¹ There can be no doubt, therefore, that the Crystal II whittling knives were also provided with metal blades. Also, the sockets on figure 5 and several other knife handles are narrow enough to have required metal blades.

The fact that the Thule Eskimos at Crystal II used stone blades on their harpoon heads even though they knew the use of metal, indicates that they possessed very little of the precious material, possibly only small bits that had been brought from Alaska and which they used only for fine carving. By 1578 they had come into possession of enough iron to risk using some of it as arrow points, for Frobisher relates (page 283) that the Eskimos at Frobisher Bay had "arrows headed with sharp stones, bones, and some with yron". This iron in all likelihood had been derived directly or indirectly from the mediaeval Norse settlers in Greenland.

ANIMAL BONES

Seal bones by far outnumbered all others, with caribou bones second in abundance. Walrus, whale, fox, polar bear, dog, wolf, musk-ox, and arctic hare were also represented, the last two by only a few bones. Many of the long bones had been broken into small pieces, evidently to get the marrow. It was observed that a large proportion of the mammal bones were those of young individuals. There were relatively few bird bones and no fish bones. Sylvia Grinnell River abounds in arctic char which undoubtedly were utilized as food, but their bones, being soft, are not preserved.

¹ Iron reached Bering Strait many centuries ago, but in such small quantities that it was used only for the tips of engraving tools and the smallest knife blades. Other types of implements all had stone blades. The source of the iron was Siberian. Its presence has been proved for the Thule-Punuk stage on St. Lawrence Island, Alaska (Collins, 1937, pp. 29, 180, 237, 304) and it now appears that the Ipiutak, the oldest known culture stage in Alaska, used iron in exactly the same way (Larsen and Rainey, 1948).

SUMMARY

The prehistoric Eskimo site, which we have called Crystal II from its proximity to the Air Base of that name, was occupied at different times by two distinct groups, the Dorset and Thule. After the first occupation—by Dorset Eskimos—the site had been abandoned for a period and vegetation grew over part of it. This former surface, now a buried sod line, was then covered with a thin layer of black soil containing refuse which accumulated during the Thule period of occupancy. The Thule people abandoned the site and it was again covered with vegetation, the present surface layer. It cannot be proved definitely whether the Dorset or Thule Eskimos built the houses. It was probably the latter, for they are typically Thule in form and construction and at the time of abandonment at least they were occupied by Thule people for only their artifacts were found inside.

Most of the Dorset specimens were relatively deep, below the old sod line; or, where that was not present, in the lower levels of the deposits. Some Dorset objects, however, were found quite near the surface, evidently as a result of later disturbance by the Thule occupants. The Dorset material at Crystal II seems to represent an early phase of that culture. There were, for instance, none of the large heavy Dorset harpoon heads (Closed socket type B-2 (*a*)) which developed during the later phases of the Dorset, a harpoon form that was ancestral to one of the basic modern eastern types, early examples of which appear at Thule sites to the north and west.

As at some other Dorset sites, harpoon heads outnumbered other types of bone and ivory implements. In fact, except for harpoon heads and stone implements, there were surprisingly few recognizable Dorset artifacts. About half of the harpoon heads are so small that they would seem to have been better adapted for spearing fish than marine mammals. On the whole, the Dorset material tells us very little as to how these mysterious people actually lived. Though more than 20 years have elapsed since Jenness first described the Dorset culture, it remains in many respects as elusive as ever.

The total number of Thule specimens was not great but they happened to include most of the "representative forms" of the Thule culture listed by Mathiassen (1927, II, pages 4-5). The finds, therefore, provide an adequate general view of most aspects of the economy of the Thule Eskimos who occupied the site. They also enable us to fix the position of this south Baffin Island variant in the framework of the Thule culture as a whole. We may assume that the houses were occupied in winter when seals could be hunted on the ice in Frobisher Bay. In summer the people probably lived in tents. Like other Thule Eskimos they also built snow houses, probably for use while travelling. They obtained caribou in considerable numbers, as the bones indicate. We cannot know whether they moved inland during the summer to hunt caribou around Lake Amadjuak as the modern Frobisher Bay Nugumiut did in later times. Caribou were probably so plentiful in summer that to get them it may have been necessary only to make short hunting trips into the interior, some of the people meanwhile remaining on the river for salmon fishing.

Comparison of the Thule material from Crystal II with that from other localities leads to the conclusion that this is one of the oldest known Thule

sites. It was probably contemporaneous with, or slightly older than, Naujan at Repulse Bay and Inuarfigssuaq in NW. Greenland, the age of which may be estimated at from 650 to 1,000 years. A number of the harpoon heads and other objects are identical with Thule-Punuk types in Alaska. Except for the ulu handle (Plate VII, figure 8) and three harpoon heads with drilled lashing holes, there is no indication of the secondary development in harpoon heads and other implements that occurred after the Thule culture became established in the East. Somewhere in the Eastern Arctic there are probably older Thule sites than this. On theoretical grounds we would expect these to be sites whose harpoon heads still retained some features of the Alaskan Birnirk heads, as the Birnirk was the Alaskan stage immediately ancestral to Thule. But whatever its date, Crystal II was a site established by Thule Eskimos who had not been long out of Alaska, a group that moved down to southern Baffin Island at about the same time that other Thule people turned north and followed the islands in the northern part of the archipelago to Greenland.

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House No. 3, Sylvania Grinnell River.



House No. 4, before excavating.



House No. 4, after excavation.

PLATE V¹

- Figure 1. Dorset harpoon head, ivory. Beneath stone in entrance passage, House 4, depth 22 in.
 Figure 2. Dorset harpoon head, ivory. Outside House 4, depth 13 in.
 Figure 3. Dorset harpoon head, antler. Beneath sleeping platform supports, House 4, depth 26 in.
 Figure 4. Dorset harpoon head, ivory. Outside House 4, depth 14 in.
 Figure 5. Dorset harpoon head, antler. Outside House 4, depth 10 in.
 Figure 6. Dorset harpoon head, ivory. Outside House 1, depth 25 in.
 Figure 7. Dorset harpoon head, ivory. Outside House 1, depth 19 in.
 Figure 8. Dorset harpoon head, ivory. Outside House 4, depth 12 in.
 Figure 9. Thule harpoon head, antler. Outside House 1, depth 20 in.
 Figure 10. Thule harpoon head, antler. Inside House 4, depth 24 in.
 Figure 11. Thule harpoon head, ivory. Outside House 4, in cache, depth 24 in.
 Figure 12. Thule harpoon head, bone. Outside House 1, depth 5 in.
 Figure 13. Thule harpoon head, antler. Outside House 1, depth 6 in.
 Figure 14. Thule harpoon head, antler. Outside House 1, depth 13 in.
 Figure 15. Thule harpoon head, antler. Outside House 1, depth 12 in.
 Figure 16. Thule harpoon head, ivory. Outside House 4, in cache, depth 23 in.
 Figure 17. Thule harpoon head, antler. Inside House 4, depth 22 in.
 Figure 18. Thule harpoon head, bone. Outside House 1, depth 8 in.

¹ Specimens on Plates V-X photographed by John O. Brostrup, Bureau of American Ethnology, Smithsonian Institution.



PLATE VI

- Figure 1. Harpoon foreshaft (Dorset), bone. Outside House 3, depth 7 in.
Figure 2. Harpoon foreshaft, ivory. Outside House 4, depth 14 in.
Figure 3. Harpoon socket piece, antler. Outside House 1, depth 21 in.
Figure 4. Harpoon ice pick, ivory. In entrance passage, House 3, depth 34 in.
Figure 5. Harpoon ice pick, antler. Beneath sleeping platform supports, House 4, depth 23 in.
Figure 6. Fish lure, bone. Outside House 4, depth 9 in.
Figure 7. Float mouthpiece, ivory. Outside House 1, depth 13 in.
Figure 8. Bola weight, bone. Outside House 1, depth 21 in.
Figure 9. Lance head, bone. Outside House 1, depth 5 in.
Figure 10. Bird dart side prong, ivory. Outside House 1, depth 12 in.
Figure 11. Arrowhead, antler. Outside House 4, depth 11 in.
Figure 12. Bird dart centre prong, ivory. Outside House 1, depth 7 in.
Figure 13. Arrowhead, antler. In entrance passage, House 3, depth 34 in.
Figure 14. Arrowhead, antler. Outside House 4, depth 26 in.
Figure 15. Arrowhead, antler. Outside House 4, depth 8 in.
Figure 16. Arrowhead, antler. Outside House 4, depth 8 in.
Figure 17. Bow brace, bone. Outside House 3, depth 18 in.
Figure 18. Bow brace, bone. Outside House 4, depth 20 in.



PLATE VII

- Figure 1. Knife handle (Dorset), antler. Outside House 4, depth 22 in.
- Figure 2. Knife handle (Dorset), antler. Outside House 4, depth 13 in.
- Figure 3. End of knife handle (?), antler. Inside House 4, depth 20 in.
- Figure 4. Knife handle, antler. Inside House 3, depth 13 in.
- Figure 5. Knife handle, antler. Outside House 1, depth 13 in.
- Figure 6. Knife handle, ivory. Inside House 3, depth 21 in.
- Figure 7. Knife handle, ivory. Outside House 4, depth 9 in.
- Figure 8. Ulu handle, bone. Outside House 1, depth 12 in.
- Figure 9. Scraper, antler. Outside House 4, depth 6 in.
- Figure 10. Scraper, caribou leg bone. Inside House 3, depth 10 in.
- Figure 11. Drill mouthpiece, caribou astragalus. Outside House 1, depth 19 in.
- Figure 12. Drill shaft, wood. Outside House 4, in cache, depth 24 in.
- Figure 13. Snow knife handle, bone. Outside House 4, depth 11 in.
- Figure 14. Adze head, bone. Inside House 4, depth 23 in.
- Figure 15. Scraper, caribou scapula. Under sleeping platform, House 3, depth 22 in.
- Figure 16. Drill point, bone, originally a compound knife handle. Outside House 1, depth 12 in.



PLATE VIII

- Figure 1. Ivory spatula (Dorset). Outside House 4, depth 8 in.
 Figure 2. Trace buckle, ivory. Inside House 3, depth 11 in.
 Figure 3. Trace buckle, ivory. Outside House 4, depth 22 in.
 Figure 4. Comb, ivory. Outside House 4, depth 6 in.
 Figure 5. Link pendant, ivory. Outside House 4, depth 13 in.
 Figure 6. Pendant, ivory. Inside House 4, depth 19 in.
 Figure 7. Pendant, ivory. Outside House 4, depth 20 in.
 Figure 8. Pendant, fox canine. Outside House 2, depth 18 in.
 Figure 9. Pendant, fox molar. Outside House 1, depth 4 in.
 Figure 10. Brow band, antler. Outside House 4, depth 5 in.
 Figure 11. Polar bear carving, ivory (Dorset). Outside House 4, depth 11 in.
 Figure 12. Seal carving, ivory. Outside House 4, depth 13 in.
 Figure 13. Ivory ornament. Outside House 4, depth 9 in.
 Figure 14. Ivory object. Outside House 3, depth 17 in.
 Figure 15. Bird bone inserted in another. Inside House 2.
 Figure 16. Piece of cut mica. Outside House 4, depth 10 in.
 Figure 17. Box or pail handle, ivory. Outside House 4, in cache, depth 24 in.
 Figure 18. Baleen toy. Outside House 4, in cache, depth 32 in.
 Figure 19. Dish bottom, wood. Beneath platform supports, House 4, depth 24 in.
 Figure 20. Sherd, soapstone vessel. Inside House 4, depth 28 in.
 Figure 21. Sherd, earthenware vessel. Outside House 1, depth 10 in.



PLATE IX

- Figure 1. Projectile point, chert. Outside House 4, depth 10 in.
 Figure 2. Projectile point, chert. In passage of House 3, depth 42 in.
 Figure 3. Projectile point, chert. Outside House 4, depth 6 in.
 Figure 4. Projectile point, chert. Outside House 4, depth 25 in.
 Figure 5. Projectile point, chert. Outside House 1, depth 22 in.
 Figure 6. Projectile point, chert. Outside House 4, depth 13 in.
 Figure 7. Projectile point, chert. Outside House 1, depth 9 in.
 Figure 8. Projectile point, chert. Outside House 4, depth 12 in.
 Figure 9. Tanged blade, chert. Outside House 4, depth 25 in.
 Figure 10. Tanged blade, chert. Outside House 4, depth 8 in.
 Figure 11. Tanged blade, chert. Outside House 4, depth 20 in.
 Figure 12. Tanged blade, chert. Outside House 4, depth 19 in.
 Figure 13. Knife blade, chert. Outside House 1, depth 5 in.
 Figure 14. Knife blade, chert. Outside House 4, depth 12 in.
 Figure 15. Knife blade, chert. Outside House 4, depth 9 in.
 Figure 16. Knife blade, chert. Outside House 1, depth 12 in.
 Figure 17. Knife blade, chert. Outside House 4, depth 8 in.
 Figure 18. Knife blade, chert. Inside House 4, depth 7 in.
 Figure 19. Knife blade, chert. Outside House 4, depth 7 in.
 Figure 20. Knife blade, chert. Outside House 4, depth 16 in.
 Figure 21. Knife blade, chert. Outside House 4, depth 8 in.
 Figure 22. Knife blade, chert. Outside House 4, depth 11 in.
 Figure 23. Knife blade, chert. Outside House 1, depth 14 in.
 Figure 24. Chipped blade, chert. Outside House 4, depth 15 in.
 Figure 25. Side scraper, chert. Outside House 4, depth 19 in.
 Figure 26. Side scraper, chert. Outside House 1, depth 4 in.
 Figure 27. Side scraper, chert. Outside House 4, depth 5 in.
 Figure 28. Side scraper, chert. Outside House 4, in cache, depth 30 in.
 Figure 29. Chipped blade, chert. Outside House 4, depth 15 in.
 Figure 30. Knife blade, chert. Outside House 3, depth 13 in.
 Figure 31. Knife blade, chert. Outside House 4, depth 18 in.
 Figure 32. Knife blade, chert. Inside House 3, depth 30 in.
 Figure 33. Knife blade, chert. Outside House 1, depth 18 in.
 Figure 34. Knife blade, chert. Outside House 4, depth 14 in.
 Figure 35. Knife blade, chert. Inside House 3, depth 8 in.
 Figure 36. Knife blade, chert. Inside House 4, depth 18 in.
 Figure 37. Lamellar flake, chert. Outside House 4, depth 19 in.
 Figure 38. Lamellar flake, chert. Outside House 4, depth 17 in.
 Figure 39. Burin-like implement, quartz. Outside House 3, depth 16 in.
 Figure 40. Burin-like implement, chert. Outside House 4, depth 14 in.
 Figure 41. Burin-like implement, chert. Outside House 4, depth 20 in.
 Figure 42. Burin-like implement, chert. Outside House 4, depth 17 in.
 Figure 43. Burin-like implement, nephrite. Outside House 4, depth 22 in.

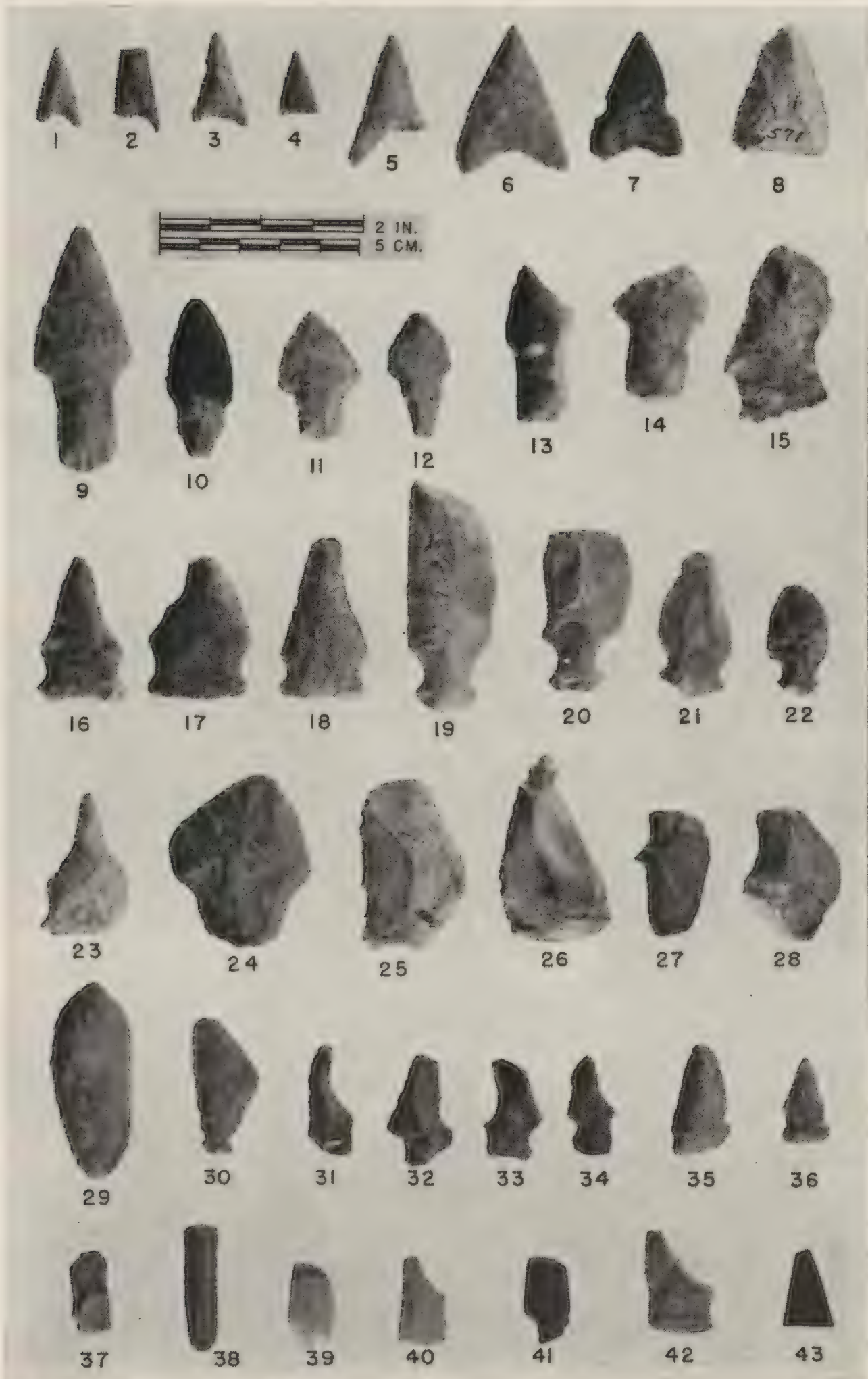


PLATE X

- Figure 1. Scraper, chert. Outside House 4, depth 8 in.
Figure 2. Scraper, chert. Outside House 1, depth 4 in.
Figure 3. Scraper, chert. Outside House 4, depth 13 in.
Figure 4. Scraper, chert. Outside House 4, depth 18 in.
Figure 5. Scraper, chert. Outside House 4, depth 10 in.
Figure 6. Scraper, quartzite. Outside House 4, depth 10 in.
Figure 7. Scraper, chert. Outside House 4, depth 11 in.
Figure 8. Scraper, chert. Outside House 3, depth 25 in.
Figure 9. Scraper, quartz crystal. Outside House 4, depth 25 in.
Figure 10. Scraper, quartz crystal. Outside House 4, depth 21 in.
Figure 11. Scraper, quartz. Outside House 1, depth 17 in.
Figure 12. Scraper, chert. Outside House 4, depth 20 in.
Figure 13. Scraper, chert. Outside House 1, depth 17 in.
Figure 14. Scraper, chert. Outside House 4, depth 23 in.
Figure 15. Scraper, chert. Outside House 4, depth 22 in.
Figure 16. Scraper, chert. Outside House 1, depth 21 in.
Figure 17. Scraper, chert. Outside House 4, depth 23 in.
Figure 18. Knife blade, slate. Outside House 4, depth 19 in.
Figure 19. Knife blade, slate. Outside House 4, depth 15 in.
Figure 20. Piece of worked feldspar. Outside House 1, depth 15 in.
Figure 21. Adze blade, nephrite. Outside House 4, depth 7 in.
Figure 22. Adze blade, diabase. Outside House 4, depth 11 in.
Figure 23. Whetstone, slate. Inside House 4, depth 26 in.



ABORIGINAL TREE-FELLING

By Douglas Leechman

One of the many difficulties confronting the archæologist is that of determining the purpose of certain stone tools, and precisely how they were used. Even such a familiar object as a thumb-nail scraper is still interpreted in several ways by various authorities.

Another well-known tool, which is not yet completely understood, is the stone celt. It is generally thought that some of them were hafted so as to be used as we use an axe; others were hafted as adze blades are. In both cases it is a little difficult to see how so blunt an edge could be effective as a cutting instrument.

PLATE XI



Spruce stump, cut with stone tools. Photo by H.S. Bostock.



Figure 1. Stone celt in haft of spruce root. After Osgood.

There are a few places in the world where stone tools are still in use, and others where they have been discarded so recently that they are clearly remembered by the native people. Among the latter is the Yukon Territory, where the older people are only one or two generations removed from aboriginal conditions. Until the Gold Rush of 1898, the number of white men in the Yukon was so small that the natives in many districts were almost unaffected by their presence, and what little was available in the way of European trade goods was not nearly enough to displace native materials and implements.

Many of the older people well remember seeing stone tools in use, including the celt, and specimens of these are kept by some of them as reminders of early days and to show their children and grandchildren.

While doing archaeological work in the Yukon in 1945, 1946, and 1948, I discussed the use of these tools with several natives, especially with regard to their use in felling trees. My attention had been drawn by Dr. Hugh S. Bostock, of the Geological Survey of Canada, to the existence of small spruce stumps, which he understood had been cut with native tools, and he was good enough to present one to the National Museum of Canada in 1938.

It was in 1945 that I first saw them still standing, near Edith Creek at Mile 1146 on the Alaska Highway, and since then I have seen many others. They are not at all rare and may be found in all areas once frequented by the natives. Spruce is the only species I have seen, but there is no reason to suppose that other trees would be treated differently.

Most of the stumps examined were less than 6 inches thick at the point where they had been cut, but trees of almost any size could have been felled if it was found necessary or desirable. Nearly always the stumps stand in the shelter of larger living spruces. The wood is usually hard and sound, except at ground level where it is completely rotted, so that a strong push is usually enough to break the trunk from the roots.

The Indians are familiar with these stumps and are glad to point them out to people who show any interest in Indian customs and life. At least four people in four different places told me how the trees were felled, and their accounts agreed completely.

Two different types of tools could be used. One was a wedge of caribou antler, shaped like a cold chisel, which was driven into the wood with a maul or stone hammer. The other was a celt, made of greenstone or some other dense, hard rock, and hafted to a spruce root handle. When the wedge was used, it was held horizontally and driven into the tree trunk at a convenient height above the ground, usually about $2\frac{1}{2}$ or 3 feet. It was so held as to enable the workman to pry off a vertical slab of the tree trunk about $1\frac{1}{2}$ inches wide, $\frac{1}{4}$ inch thick, and 8 or 9 inches long. When the first slab or sliver had been removed, the edge of the wedge was placed near one side of the scar thus produced and a second slab was pried off. This procedure was repeated till the tree trunk had been completely encircled. If necessary, a second or even a third round was cut, but this was done only when larger trees had to be felled.

The stone celts vary somewhat in size and shape. In most cases they are provided with one or two grooves to prevent the lashing that secured

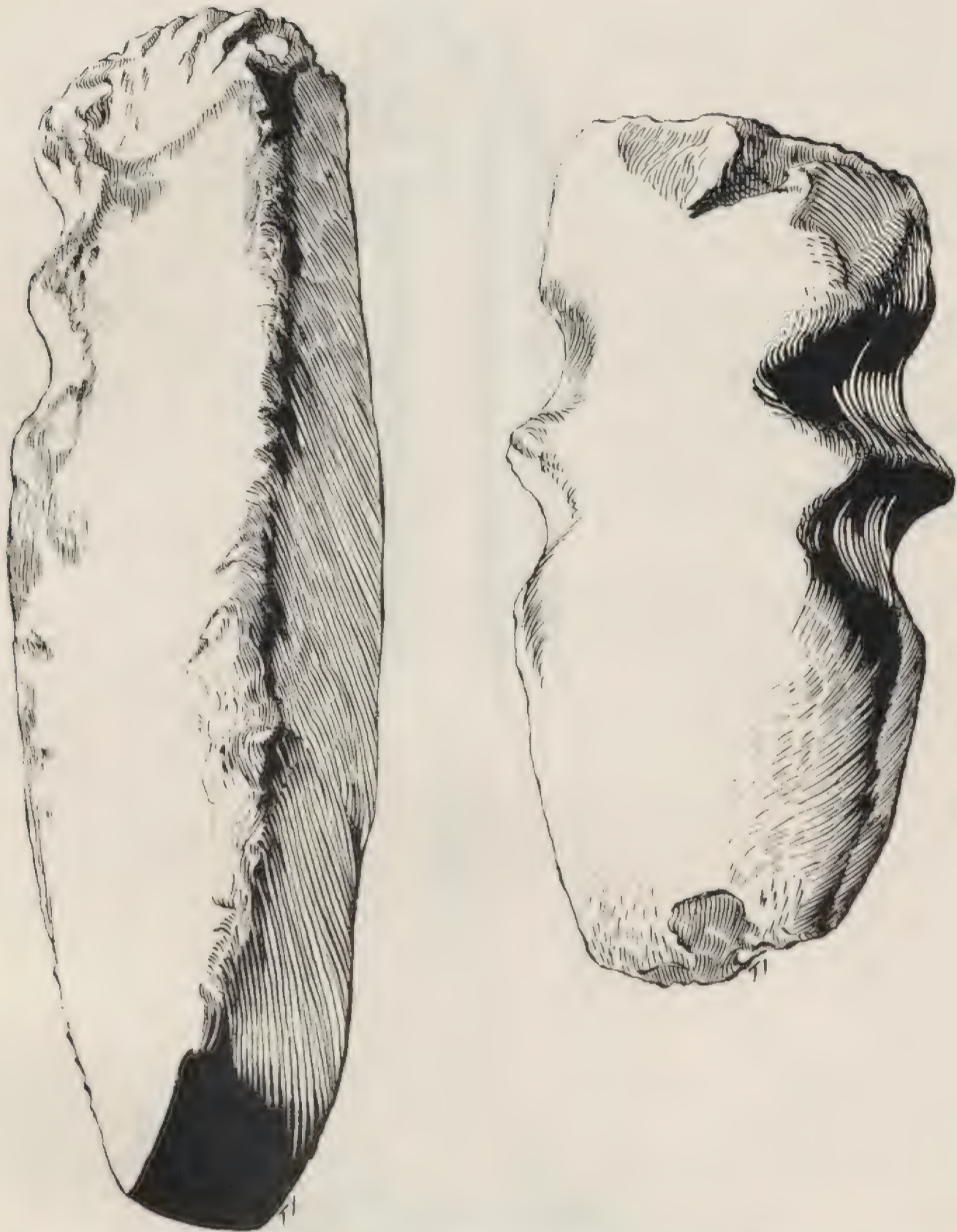


Figure 2. Two different types of stone celts. Specimens in the National Museum of Canada.

them to the handle from slipping. The groove may go three-quarters of the way round or may be little more than a pair of notches. An average celt would be about 8 inches long and $1\frac{1}{2}$ inches square.

When the hafted stone celt was used instead of an antler wedge, the same procedure was followed, the blade being so wielded as to enable the axeman to knock off slabs just as in the previous method.



Figure 3. Sketch of tree stump cut with stone tools, showing flake scars and splintering, and rotted part at ground level.

Once the tree was sufficiently weakened, a long pole was applied at a point as high up as possible, and the tree was forced over by pushing. The stumps show the scars left by the removal of the slabs of wood, and the splintered middle part, much like that left when a tree is felled by our own methods.

Not infrequently several stumps are found in a comparatively small area; there might be as many as six or eight within a radius of 30 or 40 feet. All the informants agreed that these trees had been cut down for firewood, except when green trees were cut because the wood was needed for some special purpose.

That they are often found far from a trail or river bank can be attributed to a well-known Indian custom, still being followed. If a hunter kills a moose in the bush, it is easier to move camp to the vicinity of the dead animal than to carry the meat out. Camp is set up near the carcass and it is then easy to butcher, gut, and skin it. The skin can be tanned on the spot, while the meat dries, and the family lives comfortably, close to the source of food, until it is consumed. Dead spruce trees make the best firewood and their stumps remain to tell of the presence of these people years ago.

Frank Johnson, an Indian living at Teslin, in the Yukon, told me that when steel axes were first available, two men staged a contest to see if the new kind of axe was superior to the stone one. In both of two attempts the man with the stone axe won. It must be noted, however, that the steel axe is in universal use today at Teslin as it is everywhere else in the Yukon. Possibly the losing contestant attempted to follow native methods with it.

ETHNOLOGICAL SURVEY OF SOUTHERN YUKON TERRITORY, 1948

(Preliminary report)

By Catharine McClellan and Dorothy Rainier

PURPOSE OF SURVEY AND SUMMARY OF ACTIVITIES

During the summer we visited Indian groups living in the Yukon Territory just north of the high coastal mountain range. We wished to obtain as much general ethnographic material as possible from the little-studied people of this area and to concentrate in particular on the relations of these Indians with the Tlingit-speaking inhabitants of the Alaska coast.

We began our work at Carcross on June 27 and stayed there for about 3 weeks. Other places at which we spent a week or more are Klukshu, Burwash Landing, and Teslin. Shorter trips were made to Haines and Klukwan in Alaska, the summer camp of Chief Albert Isaac of Aishihik on the Big Arm of Kluane Lake, Champagne, Tagish, and the West Taku Arm of Tagish Lake. Some time was also spent in Whitehorse in order to make arrangements for our stays at Klukshu and Teslin and because of a short illness of one member of the party. We concluded our work on September 9.

Dr. Douglas Leechman, under whose supervision we were working, was able to visit us at Carcross, Klukshu, and Teslin. We also went with him to Haines and Klukwan in Alaska, and to Champagne. His familiarity with the country and people made our work much easier.

The trips to Alaska and to Champagne were made possible through the kindness of Mr. J. Meek, Indian Agent at Whitehorse. Mr. Meek was very helpful to us throughout the summer. He provided us with transportation to Klukshu and with camping equipment. He also arranged for us to live in the Indian Agency's cabin during our stay at Teslin and gave us pertinent information about the Indians in the area.

The Reverend Mr. Lee of the Indian Mission School at Whitehorse generously gave us the use of his cabin at Klukshu. He also drove us from Whitehorse to Klukshu for our second week's stay.

The Harvard Yukon Expedition enabled us to visit Chief Isaac's camp on the Big Arm of Kluane Lake, by taking us as passengers on a boat chartered by them. In addition to showing us much hospitality, members of the Harvard party freely gave us the benefit of their familiarity with the Burwash Indians. Several profitable discussions with them resulted in background that we would have had difficulty obtaining in the short time we were at Burwash.

INDIAN GROUPS VISITED

Carcross. Carcross lies at the junction of Lake Bennett and Lake Tagish. It was formerly known as Caribou Crossing because of the huge herds of caribou that used to cross the channel here. The Indian village

is on the south shore of Tagish Lake opposite the White settlement. The census of 1944 lists 121 Indians at Carcross, but less than half this number were in the village during our stay.

The Indians now living at Carcross are in all probability the Tagish Indians mentioned by Schwatka and others. Informants told us of the old village at Tagish where their people lived until the railway attracted them to Carcross. One of the prominent Carcross Indians still maintains a house at Tagish. We visited the old graveyard there. This was pillaged considerably during the war, but the gravehouses still contain many Chinese chests and wooden boxes full of burned bones and beads. Both chests and boxes were bought from Tlingit traders. Memory of Tagish trade with the coastal Tlingit is still strong. One of the informants remembers the first time that the Tagish people crossed the mountains and went down to the Dyea trading post themselves, instead of depending on Tlingit intermediaries.

The general economy of the Tagish Indians in the old days seems to have been distinctly Athabasean in flavour. Nevertheless the Carcross Indians speak a Tlingit dialect and say that they have always done so.

Social organization seems to show coastal influence. There are two exogamous groups, called Crow (Raven) and Wolf. The social system based on this moiety division has only recently begun to break down. Some evidence points to the existence of recognized clans within the moieties, but the data are fragmentary and will need very careful study.

Several excellent older informants live at Carcross. Many of the younger Indians speak only English, and memory of the old culture is disappearing.

Teslin. The Indian settlement on Lake Teslin is at Nisutlin Bay. An older settlement at the end of the lake was frequently referred to by the informants. It centred around a trading post established there in the late nineteenth century.

The Teslin people seem to be a vigorous group and were extremely co-operative, although very few families were in the village at the time of our visit. Most people had gone moose hunting. The latter part of June and the first weeks in July would be an excellent time to visit here. The census lists 150 Indians at Teslin.

A Tlingit dialect is also spoken at Teslin, but it differs slightly from the speech of the Carcross people. The general economy seems to be much like that of the Carcross group, and a moiety system also is observed here. A number of clans are definitely recognized. There is strong adherence to many aboriginal customs.

At present we are inclined to think that the Teslin people might be the Taku Athabascans briefly referred to in the literature—not to be confused with the Tlingit who live at the mouth of the Taku River and who are also known as the Taku Indians. Our material, however, shows close relations between the Teslin Indians and this coastal tribe for purposes of trade and making war on the Tahltan Indians to the south of Teslin.

The Indians at Atlin in British Columbia seem to belong in a unit with those at Teslin, as far as we could ascertain both at Teslin and from the Atlin informant on the West Taku Arm. Atlin should certainly be

visited in order to study this group of Indians thoroughly. Much more material can be obtained at Teslin, some of which would probably clarify the Carcross problem as well.

Klukshu. Klukshu is an Indian fishing camp on the Haines road close to Mile 119. The people who fish there in summer now live at Champagne in the winter. Before the trading post was established at Champagne in 1902, their main village was at Dalton Post a few miles southwest of Klukshu on the old Dalton Trail.

Fishing at Klukshu is for salmon, which generally begin to run heavily in the middle of August. About five families were in camp when we arrived, but the number increased to about ten during our stay.

The Dalton Indians ordinarily speak an Athabascan language, but many of the older people also know Tlingit. There is considerable blood relationship and personal friendship with the Indians of Klukwan, which is a Chilkat Tlingit village just south of the mountains. Traditions of trade and intermarriage of the Dalton people with the Chilkat are very strong. However, the Dalton people seem to consider themselves as belonging specifically in a group with Indians at Burwash Landing, Aishihik, Carmacks, Kloo Lake, and Hutshi. All of these people seem to speak the same language with minor dialectic variations. A good deal of careful work will have to be done in order to group the Indians in this area accurately. We were able to visit only the Burwash Landing people and the summer camp of the Aishihik Chief in addition to the Dalton Indians.

The relation of the above group to the Selkirk and Dawson Indians is also of great interest. Authorities frequently list Indians of the entire upper Yukon region as Tutchone or Kutchin. "Tutchone" according to one informant is a Selkirk word meaning "cup". If one follows Osgood's Kutchin distribution, which is based essentially on linguistic considerations, it seems evident that the southern Yukon groups in question cannot be called Kutchin correctly.

The general economy of the Dalton people reflects many interior traits. Their mythology includes the Raven cycle, which is well known on the coast. There is again a moiety division into Crows (Ravens) and Wolves. The local chiefs apparently had considerable influence in earlier times.

No other white people were at Klukshu. The Indians received us very cordially and were interested in our work. Frequently, however, they were too busy hunting and fishing to talk for long periods of time.

Burwash Landing. Burwash Landing is on the northwest shore of Kluane Lake. The 1944 census lists 49 Indians there. When we were at Burwash all of the men but one were away from the settlement serving as guides for hunting or fishing parties, but there were several excellent female informants.

As mentioned in the previous section, the Burwash people speak an Athabascan language. An interior manner of life is very marked here. A social system based on exogamous moiety rules and other aboriginal customs is still maintained with some vigour. Traditions of trade with the coastal Tlingit and with the Carcross Indians are strong. Until quite recently there seems to have been considerable fighting with other native groups in the area, especially with the Dalton and Snag people.

Our informants said that the Snag people (Nabesna?) are the closest group of Indians north of Burwash and that they speak an unintelligible language. They are traditional enemies of the Burwash Indians. The wife of a slave taken from Snag still lives at Burwash.

At least some of the ancestors of the Burwash Indians lived on the White River in earlier times and controlled the manufacture and trade of native copper implements.

Because of their former trading position and present adherence to many aboriginal customs, the Burwash and Dalton people seem to us to be particularly vital groups to study. They have not been treated in anthropological literature so far as we know.

The same may be said for the Aishihik Indians. Although we did not go to the village itself, we were able to visit the summer hunting camp of the chief of this group. Hunting still plays a large part in the economy of these people.

CONCLUSIONS

The problem we had set ourselves appeared to grow increasingly complicated as investigation of it proceeded. Careful working over the summer's notes will undoubtedly give us a better perspective of the situation. Many of our first impressions and guesses will have to be altered or discarded.

The aboriginal food gathering economy of all the groups follows a northern interior Athabaskan pattern. Geographical environment is, of course, a strong factor in this. The social organization and the mythology, however, seem to show rather strong affiliations with the coast. All groups visited have a moiety division into Wolf and Crow (Raven), apparently analogous to the Wolf and Raven moieties of the coastal Tlingit. They also possess the typical Raven cycle of the coast. Yet other stories collected are distinctly interior in pattern.

The importance of Tlingit trade with these groups in the decades before the discovery of gold was emphasized everywhere.

Our reception by the Indians was very cordial in every place. We feel that further work should be done in this area as soon as possible. The natives have not been studied by ethnologists although they live in an important aboriginal contact area. Nineteenth century Indian culture was badly shaken by the Gold Rush, and aboriginal ways are now rapidly disappearing. This process has been speeded up recently by the building of the Alaska Highway which has made the area much more accessible. All groups seem to place a prestige value on acquiring white man's ways and on speaking English. Very few individuals are left who remember pre-Gold Rush days from personal experience. If these people are not studied soon, there will be little hope of solving many problems of linguistics and aboriginal groupings.

EXPLORATION IN UNGAVA PENINSULA

By J. P. Michea

The area described in the present report lies between Hudson Bay and Ungava Bay in the northern part of the Province of Quebec; it is a peninsula approximately 400 miles long and 350 miles wide.

This region to the present has remained one of the least known parts of all the eastern Canadian Arctic. During the winter, the natives of the sea coast rarely travel across it. Once in the summer, in 1912, Robert Flaherty ascended North Payne River and descended Povungnituk River. Because of the need of further knowledge, Jacques Rousseau, Director of the Montreal Botanical Garden, organized an expedition, the aim of which was to make a new attempt to cross the peninsula, from west to east, that is, from Povungnituk to Payne Bay, following the completely unknown course of Kogaluk River, crossing the divide by a portage route so far unexplored, and finally descending Payne River of which only a small part was known to Flaherty.

The party consisted of: J. Rousseau, botanist (in charge); E.-Aubert de la Rue, geologist (representing The Arctic Institute of North America); Pierre Gadbois, geographer (representing the Geographical Bureau of the Department of Mines and Resources); the writer, ethnologist (from the National Museum of Canada); and a group of four Indian guides, Algonquins, from Seven Islands, Quebec.

The expedition left Dorval Airport, near Montreal, July 1, 1948, by R.C.A.F. plane, arriving at Goose Bay the same day after two short stops at Dartmouth, Nova Scotia, and at Moncton, New Brunswick. After a week's delay the party was flown to Fort Chimo on July 7.

Mr. Wright, agent of the Hudson's Bay Company met the party at Fort Chimo and conveyed its members to the trading post, a few miles down Koksoak River. Here Dr. Rousseau found the canoes left on George River the previous year. After the supplies and equipment were assembled, the party went back to the American base, on July 8. An amphibian plane, or "Canso", from Roberval, Lake St. John, arrived on July 12, to take the members of the party to Povungnituk, but because of bad weather a start could be made only on July 14.

Instead of travelling eastward from Hudson Bay, the plane headed towards Payne Lake, which was sighted, free of ice, about 10 o'clock. A stop was made there to cache supplies and equipment on one of the five islands in the bay southwest of the lake. The altitude of Payne Lake, as then recorded is from 400 to 450 feet.

The "Canso" then proceeded to the upper part of Kogaluk River. After 1½ hours it reached the lower part of Povungnituk River, where it could not stop because of a rough sea. A message was dropped to the H.B.C. Post and a landing was made 20 miles to the south, at the mouth of Kogaluk River, where the baggage was unloaded, and the base camp was set up. The H.B.C. peterhead boat conveyed the party back to the trading post, where it was welcomed by Mr. Tolboom.

On July 16, the group returned to camp, where two Eskimos joined it, and directed it to the headwaters of Kogaluk River. The help of these added guides was very useful in the transportation of the equipment and in making the portage. Later, on July 30, the Eskimos were dismissed and went back home in their own canoe.

The voyage up Kogaluk River, begun on July 17, lasted 14 days. Twenty-five portages were made. On July 27, the expedition made camp on the north shore of Tassiat Lake. The first part of the trip was over.

The second part proved more strenuous, because of a long portage between Tassiat and Payne Lakes. The native guides did not know the easiest route, as they had never crossed this country before in the summer. Later it was learned that a better route could have been followed. Another portage strewn with many obstacles was made on July 28, and the shores of Payne Lake were reached on August 2, where the materials previously cached were found in good condition.

The shore at the eastern end of Payne Lake, because of a favourable northwest wind, was reached on August 4. The most interesting discovery of the whole voyage was made at the head of Payne River, where archæological sites of extreme importance were found. On August 5, careful notations of the location of these ruins were taken in the hope that a future expedition would provide a chance for securing further information. The journey down Payne River was continued on August 6 and the party arrived at Payne Bay Post on August 12, where it was met by Mr. T. Crawford, H.B.C. factor. This completed the first west to east crossing of the peninsula.

It is estimated that if the trip had been taken in the reverse direction, from west to east, it might have taken twice as much time. This is due to the topography. The east coast of Hudson Bay is a lowland, strewn with long beaches and bars, with many reefs; the tides, only a few feet high; the land ascends with a series of terraces. These terraces along Kogaluk River hold a chain of shallow lakes, linked together by waterfalls, where altitude is gained within a comparatively short distance. The eastern slope of the peninsula, on the other hand, is a plateau that retains its altitude close to the sea-coast. Payne River has its headwaters at Payne Lake at a height of 400 feet. It becomes deeper as it proceeds through a picturesque canyon. The rapids travelled were with one exception navigable. Travelling in the reverse direction would have taken twice as long and involved more difficulties in portaging. In the season of frosts it is likely that these rapids would be too rough for travel in canoes, and the water would be too shallow for navigation at the end of the summer. We happened to be there at the right time for a trip down.

Most of the time during the whole trip, the weather was warm, although there was a constant wind from the east during the first period, and then a western wind after reaching Payne River. The mosquitoes, and particularly the blackflies, were everywhere a nightmare. The fauna of the peninsula, as far as could be observed, was limited to birds and fish: wild geese, ducks, loons, partridges, hawks, owls; and grey trout. Fresh caribou tracks as well as two caribou were seen in Payne River Valley. Hundreds of these animals used to live there in the past.

On August 19, Messrs. Rousseau, de La Rue, and Gadbois left for Fort Chimo. Mr. Gadbois planned to stay there some time for his geographical studies. The writer remained among the Eskimos.

He went first to a native camp at the mouth of Payne Bay; then, on August 22, returned to the Post, and left the next day for the Koartak camp. From Koartak, he visited native camps along the coast, by passing Cape Hopes Advance, Diana Bay, Wakeham Bay, and Sugluk. Numerous archæological ruins were found in these last sites but most of these ruins had been excavated by the natives themselves for their own use so that their importance for archæology has been much reduced. Information was gained of the exact location of two groups of old stone houses that are still intact, but there was no opportunity to visit them.

On September 22, he stopped again at Wakeham Bay and remained from September 22 to October 2 with the missionaries. Then he travelled on the M.V. *Regina Polaris*, a supply boat of the Hudson Bay Vicariat. The boat stopped at Koartak but had to bypass Payne Bay where the greater part of the notes, photos, documents, and specimens had been left. Arrangements were later made to retrieve them.

From September 26 to October 2, the M.V. *Regina Polaris* stopped at Fort Chimo. The short stay there afforded an opportunity for a brief, investigation of the natives of the Post and at the military base. This group of Eskimo, situated as it is, close to the forest and Nascopie Indians, has undergone a drastic cultural evolution, at least in so far as its primitive culture is concerned.

After a brief stop at George River, the *Regina Polaris*, on October 4, left Hudson Strait and arrived at Quebec on October 11 and from there the writer proceeded to Ottawa.

RESULTS

The following is a brief summary of what was achieved.

I. GEOGRAPHY

The physical geography of the region was the concern of Mr. Gadbois, the writer being interested chiefly in the human geography, particularly that of the areas where the native camps were located. The results included:

- (1) A map, from Payne Bay to Sugluk, with names of native sites.
- (2) A map showing human vestiges along Kogaluk and Payne Rivers.
- (3) Many photographs taken of these same rivers showing the relief (which is not apparent on the aerial photographs) of the rapids, etc., accompanied by rough sketches on which locations are precisely noted and human traces indicated.
- (4) Detailed maps of the Ungava coast and Hudson Strait, with sleigh routes, etc., also a series of photographs taken at points noted on the maps. These maps are accompanied by notes on the physical character of the country.

II. ARCHÆOLOGY

The results concern the ruins found on the coast and others discovered inland.

On the Coast

A great number of old stone houses occur mostly in the proximity of Sugluk (Sadluit, in Eskimo). It was not the first time remains of that kind were discovered, as the ruins had previously been visited

by the natives. Unfortunately the findings were very limited in extent. Certain sites had been completely excavated, the earth turned over without care as to the details, so that the original plan of the houses ("Tunnit" as the Eskimo say) cannot be ascertained. It has often happened in the recent past that some stones from these ancient sites were removed and used by the natives to hold up their tents. However, it was possible to make a fairly important collection of harpoon points, arrow points, spear points, knives for women, needles, etc., some in walrus ivory, others in bone or polished stone, also a certain number of scrapers in cut stone.

In a region farther to the west, which unfortunately could not be visited during this voyage, the Eskimo speak of a place where two groups of ruins are to be found, one group on the coast, and another on inland heights, as yet unexplored. The archæological value of these sites is important, and it is to be hoped that, in the near future, a detailed study of these ruins may be undertaken.

Inland

The writer chanced upon a group of stone houses of extreme importance near the head of Payne River. It was impossible then to undertake any extensive excavations, for lack of time and because of frozen ground. These discoveries were carefully noted, with a view to ascertaining the importance of the village with approximately thirty houses and dependencies. As this village stood 150 miles by air from the coast, its ruins should contain the evidence of native culture, quite distinct and important in its day. If these remains should belong to the Cape Dorset culture, which is probable, it would be the first time Dorset features have been known to occur so far from the sea. If the remains belong to the Thule period, which seems unlikely, then they would produce evidence of a growth unknown until now. This would upset the accepted ideas concerning the Thule culture. Because of the lack of time and working tools, only a sketchy plan of the remains was made, accompanied by hasty excavations.

These excavations showed the permafrost, or some solid mirrored ice, at a depth of approximately 20 inches. Layers of horns, caribou skeletons, and soapstone pots are to be found in the top layer of the soil. Presumably they do not date back to the earlier occupancy, but to a later date, when the "houses" were either reoccupied as they were found, or as "caches" for the game, or again as caribou traps. Thorough excavations alone would determine the exact nature of this prehistoric evidence.

A third period of occupancy can be observed. This must have been seasonal, either in the summer or in the autumn. It may have taken place during the caribou hunt as it is still practiced among the Caribou Eskimo west of Hudson Bay. The natives then lived under a tupek (bell tent) made of skin. Now they camp under canvas tents. This happened within the memory of the present coast natives. The top layer of these archæological sites in this locality may date back approximately a century. Some cuts in the soil were made there, and Mr. Rousseau is now analysing the materials in a laboratory.

III. ETHNOGRAPHY

Investigations were pursued into the following features of the material culture of the present-day Ungava Eskimo: clothing (material used, prepared, sewn); lodging (igloos, tents, permanent houses); transportation (in winter, summer, kayak, paterhead); food (hunting and fishing, preparation of food, cooking); fox traps; working methods, sculpture, etc.; games (string games), songs, and dances.

IV. SPECIMENS

The ethnographical specimens brought back were: 1 kayak (Hudson Strait model); various clothing articles, and hunting weapons; about four hundred archæological objects, etc.

V. LINGUISTIC ELEMENTS

As previous research on Eskimo dialects has been extensive, no systematic study of the language was undertaken. Only the names of native sites were taken down, and numerous errors on the maps of the country were corrected. Eskimo words pertaining to the objects and other matters actually studied were also recorded.

VI. PHOTOGRAPHY

During the journey, many photographs were taken: 850, in black and white, of ethnographical and geographical features (infra-red film); 300 projections in natural colours (kodachrome); and, at the request of the National Film Board of Canada, 2,000 feet of film, 16 mm., 24 fr. per sec. in natural colours, were used, which are materials for a pictorial record of the 1948 expedition across Ungava Peninsula.

ANTHROPOLOGICAL FIELD WORK AT ILE VERTE, QUEBEC

By Marcel Rioux

(For purposes of general explanation and clarification of the report that follows, extracts only are being printed from this paper.)

In the comparative study of human cultures, the status of a peasant society is on the borderline between traditional anthropology or the study of non-literate people, and sociology or the study of modern urbanized societies.

From a theoretical standpoint, Ile Verte is a good instance of a small well-integrated community unperturbed by any acculturation process. It is an excellent field for a study of the activities of a North American peasant society, and for testing the acculturation hypothesis as formulated by Kardiner and Linton.

An extensive survey of Ile Verte was undertaken by myself with the assistance of Maurice Tremblay, Professor of French Literature at Xavier University, Cincinnati. Miss Claire Mathieu made fifty Rorschach tests among selected individuals.

Ile Verte, an island, is located off the south shore of the St. Lawrence River about 15 miles northeast of Rivière-du-Loup, Témiscouata county. For the last 75 years, its population has remained stationary at about 325 inhabitants. The local history and family data relating to this community were obtained in the parish records placed at our disposal by M. l'abbé Blais, the present parish priest. The forty island homes were all visited, and most of the people were interviewed. Although the aim was to collect as much material as could be done on all aspects of this island culture, religion and kinship drew special attention, as soon as it was found that these were the most important external sources of the local security system. Before the results can be embodied in a monograph, a second and prolonged stay on Ile Verte will be necessary.

THE MEANING AND FUNCTION OF FOLK-LORE IN ILE VERTE

By Marcel Rioux

In a peasant society, the study of oral literature is complicated by the meaning given to the word "folk-lore" by scholars who are primarily interested in the literary aspects of certain cultural phenomena. According to Lacourcière and Savard, oral literature belongs to the category of the collective and anonymous¹, and it implies a physical or spiritual need of the common man. Thus, according to these Canadian students, an oral tradition, in order to be classed as folk-lore has to be anonymous. But we deal none the less with anonymous sources that remain individual, although no name is known to the collectors of myths and tales involved in the process. Let us momentarily accept this definition and examine the nature and the function of folk-lore in the contemporary peasant group here under observation.

Ile Verte on the lower St. Lawrence is, to a great extent, representative of the old French-Canadian peasant culture. What is true of it should also be true of many communities where the acculturation or urbanization processes are slowly working. Only further studies could prove or disprove this point. For the sake of the discussion we will select our examples from folk tales and folk songs, leaving out riddles and proverbs, although they are usually included in oral literature.

In this community of 325 inhabitants, in 1948, the writer recorded 10 folk tales and 147 folk songs, most of which would be accepted as such by regular folk-lorists. In the present state of research, no author's name could be placed on these tales and songs. Most of the songs were given, independently, by five or six individuals, each over 55 years of age. Except for these singers, almost nobody in the parish knew them. A reason for this is that certain songs can be used only by definite individuals. Sometimes the relatives or friends of these singers would know the titles and a little of the tune, but would not go further. According to Linton's terminology, a cultural trait like this could be classified as alternatives or even, at times, individual peculiarities.

Among the folk songs collected in Ile Verte, *La Fille du Roi d'Espagne* (The King of Spain's Daughter) has been quoted by literary folk-lorists as an important song as much for its tune as for the age of its theme. Only three or four persons on the island recalled it after hearing it sung, and the actual singer had to search his memory before remembering it all. Although it is known in this community, this particular item does not play an active or important part there, as the informant himself admitted that he had not sung it during the last 20 years. *La Fille du Roi d'Espagne*, which originated in Italy, in the 12th or 13th century, according to Doncieux and Barbeau², tells the story of a princess who, while washing at the seashore, drops her ring into the deep waters. A gallant knight comes along,

¹ Lacourcière and Savard, 1946.

² Barbeau and Sapir, 1925.

dives for it, but is drowned. The text collected at Ile Verte closely resembles the other French and Canadian versions, and differs only in details. These slight differences are the result of paronymous attraction. The melody, like most of the French tunes collected in Canada, is archaic, and, according to specialists¹, this song, like most others in Canada, has kept more of its original form here than in France, where most of them originated.

The problem in folk tales is nearly the same. The ten folk tales collected at Ile Verte seemed to exhaust the islanders' knowledge of tales, and were told only by two persons of 75 and 80 years of age. Practically nobody else knew them, and they had not been told for many years. One of the tales, *Le Grand Voleur de Paris*, has been the object of prolonged studies by literary scholars. Herodotus was the first to record it under the title of *Le Trésor du Roi Rhampsinite*. After it had travelled in many countries on two continents, it came to Canada presumably with the early French settlers of the 17th century. At Ile Verte, a single person knew it and nobody else remembered any of it. Far from being a projection of the narrator's own mind, he could repeat it only painstakingly. The deviations of his text from the other versions consisted merely of omissions and substitutions of some features more familiar to him.

This type of oral literature is hardly cultural. If an element or a trait, to be cultural, must be *shared*, then the songs and tales of this nature certainly were not shared by the whole community or by a notable part of it. They are individual peculiarities and are handed down by a very limited number of persons. Linton uses the concept of individual peculiarities to characterize certain ideas or techniques that are not yet on the cultural level. The same term might stand for certain traits like those above, which were at one time at the cultural level, but, because of changes, have lapsed into the possession of just a few individuals. These songs and tales seem to have lost their original meaning and function. Although their form remains nearly the same as a few centuries ago, their function, appertaining to a psychic need of happiness or escape, has been lost.

As compared with the folk-lore of non-literate societies, that kind of oral literature does not fulfil the same function as the phenomena labelled folk-lore by anthropologists. In the peasant community of Ile Verte, all phenomena that may be classified as folk-lore fall into the category of the secular, whereas the same features in a non-literate peasant community belong to the sacred. The function of the traits in a non-literate society is replaced, in Ile Verte, by religion. In non-literate societies, all the elements of sacredness are not absorbed by formal religion, but in a peasant community everything sacred is part of religion. In a primitive society, folk-lore is an institution, that is, an enduring complex, an integrated organized behaviour pattern through which social control is exerted and by means of which basic social cravings or needs are met. In the French-Canadian community above, the items of oral literature just mentioned are merely survivals.

Folk-lore is an integral part of the life of the people in a primitive society, but at Ile Verte it reflects an emotional attachment for the good old times among a few of the oldest members of the society. Folk-lore in its strongholds exerts a coercive action on the mind and actions of the people; at Ile Verte, it is merely a regressing mode of evasion and escape.

¹ D'Harcourt. *Préface du Romancero du Canada*, par Marius Barbeau, Montreal, 1937.

The actual function of this literature in the French-Canadian community is next to nil, but its latent function is more important. It explains the persistence of certain cultural elements that are without any manifest function. In a conservative community like Ile Verte, where the family and kinship ties are foremost, everything recalling the dead and the ancestors is welcomed. Many songs, being the possession of certain individuals, recall the individuals who used to sing them long ago and the links between generations are tightened. The latent function, which approximates the concept of meaning in Linton's terminology, strengthens the solidarity of the group. Furthermore, those who seem nearer to the ancestors by knowing their songs acquire prestige in the community.

Should we draw any conclusions from the fact that such tales and songs were preserved and others forgotten? We doubt it, as this differentiation, between an unknown number of possibilities, depends mostly upon an accident due to the intervention of one or a few individuals, not to the group as a whole. For this reason, the *contents* of oral literature as featured here seem meaningless; they cannot be considered part of a projective system or as self-revealing of the people. Their existence and transmission from generation to generation until now merely demonstrates the cultural stability of the Ile Verte group and should be taken as a proof of the conservatism of this society.

Should we restrict folk-lore to the above-quoted Canadian definition ("an anonymous collective oral tradition"), then the anthropologist could not infer much from the study of these survivals. However, oral literature embraces more than the tales and songs already mentioned as the mode of transmission for other traits is also oral. Among such features we might quote a few songs composed by a man who used to compose songs about certain individuals of the community and local political affairs. He adapted new words to an old melody. He died in 1946 at the age of 80, and many islanders still remember some of his songs, although they cannot sing them. Yet at the time they were made and sung, their function in a way was social; they were meant to cast ridicule upon individuals whose behaviour was not in accord with the norms of the community, more specifically upon a local clique then aiming at prestige and leadership. The same function of ridicule is now replaced by gossip.

Another group of songs, more widely known in the island, may be considered as oral literature only in so far as the islanders are concerned, because its mode of transmission is also oral. It consists of a large number of modern French songs written in Paris or elsewhere in the past century; most of them sentimental romances used by women. Their function is analogous to that of the songs current in modern urban societies: amusement, evasion, and escape.

Some other narratives collected among the islanders bear on local events; others are anecdotes. They could hardly be classified as literature, yet they denote a firm social cohesion and cultural continuity.

So we may conclude that the hypotheses brought forth by anthropologists in connection with the folk-lore of a non-literate society do not apply to the contemporary French-Canadian peasant community of Ile Verte, and that the term "folk-lore" does not mean the same thing and assumes a different function when applied to these two types of society.

CANADIAN FOLK TALES RECORDED DURING THE SUMMER OF 1948 IN CHARLEVOIX AND BEAUCE COUNTIES

By Luc Lacourcière and Félix-Antoine Savard

The research carried out by Professors Luc Lacourcière and Félix-Antoine Savard in this field continues the endeavour initiated in 1914 by Drs. Franz Boas and Marius Barbeau.

For a few years we have been compiling what is intended to be a fairly complete record of the folk-lore of Charlevoix county, Quebec. The purpose of this inventory is to build up an authentic picture of folk life in this Laurentian district, in so far as it consists of oral traditions, language, ideas, customs, ways of life, and material and social aspects of existence. We have devoted to this research the summer months, directing each year our research into varied subjects, without overlooking whatever is worth attention in folk-lore.

In the summer season of 1948, our harvest consisted of a considerable number of folk tales. On these narratives alone we intend to draw up the following report, although other materials on many subjects were obtained as well.

Charlevoix county is mountainous, and heavily forested in parts, yet also agricultural and maritime. It covers about 100 square miles and contains nineteen parishes, two of which are on Ile-aux-Coudres. Travelling there, particularly on the back roads, is not always easy; it entails time and experience. We visited, in a motor car, ten parishes during the summer of 1948. These are: Les Éboulements, Saint-Joseph-de-la-Rive, Saint-Irénée, Saint-Hilarion, Clermont, Saint-Siméon (Port-au-Persil and Baie-des-Rochers), Ile-aux-Coudres, and Baie-Sainte-Catherine. This last locality, although situated in Saguenay county, is, from the point of view of folk-lore, an extension of Charlevoix county.

Outside of Charlevoix, we also gathered a collection of folk tales in Beauce county, south of Quebec. From September to November, we proceeded five times to Sainte-Marie, Beauce, where we recorded from Madame Thomas Ferland, 88 years old, seventeen folk tales and other stories.

In taking down these narratives, we used two recording machines; one is a R.C.A. Victor with disks (our own property), the other is a magnetic ribbon recorder, called Soundmirror, provided with the spools of ribbons by the Archives of Folklore at Université Laval. The first recording machine proved quite useful for songs usually very short; the second is much preferable for folk tales, because it is possible with it to work without interruption for an hour. In the localities where electric power is not available we used a dynamo, for instance at Ile-aux-Coudres, and along the back roads of Saint-Irénée and of Saint-Siméon, at Port-au-Persil, and at the Baie-des-Rochers, where we found some of our best folk-tale tellers. To each of these localities we had to go back several times, first to discover informants and size up the extent and the value of their repertory, before

engaging in the work of actual recording. Next we took down the materials in the course of many, prolonged sittings. These were usually profitable but at times handicapped by unexpected happenings, such as the illness or the absence of informants. Usually we were received everywhere with courtesy and even cordiality. The informants gladly lend themselves to our search. Some of them, without requiring the payment of wages, are pleased to accept gifts which we offer them to compensate for their labour and our interference with the family life and activities. This is particularly appropriate when we have to go back several times to the same house. Such repeated visits are frequent, as the informants are unable to exhaust their repertory in a single sitting. It is not advisable to exceed 2 hours of recording with any of these aged folk-tale tellers. We usually work in the evenings, *à la veillée*, when we install our recording machinery, and are surrounded by the members of the family and the neighbours, who often sit around out of curiosity. These gatherings, particularly when there are children, occasionally prove rather embarrassing. Our preference is to work with the informant alone, but this is seldom possible.

We have been lucky enough to secure excellent folk-tale tellers, nearly all beyond 70 years of age. Three of our best were Mme. Elzéar Gagnon, 88 years of age, M. Ulysses Dufour, 71 years old, M. Joseph Gauthier, 74, all three of whom died during the winter. This emphasizes the urgency of our research. In the next generation it will probably be too late for collecting oral traditions. At least the repertory will have considerably dwindled down. A few informants were about 50 years of age, but seldom did we find any in the younger generation. Actually, a few folk-tale tellers may be found in each parish, most of them retired farmers, who for a time were river folk or lumberjacks. Their repertory of tales enriched itself in the course of their early travels, although all of them assert that they have learned their tales when they were very young. Women, as folk-tale tellers, are much fewer and more timid in front of the recording devices. We have taken down the names of all informants we have used, their residence, as well as the list and titles of their narratives. These have already been mentioned in a preliminary report of the National Museum for the year 1949. We need now only to give an appraisal of the materials secured. Twenty folk-tale tellers were utilized. They furnished ninety folk tales or stories from 5 minutes to 2 hours each, according to the type of stories or the aptitudes of the narrator. In all we filled forty-four ribbon spools of a total duration of 44 hours; in addition, we took down in writing a few anecdotes and stories. These figures do not include folk songs and numerous items on games, etc.

Once field work is completed with its heavy harvest, a prolonged period of office work is needed for the accurate transcription of the texts. This operation requires time and skill. To reproduce a spool of the Soundmirror extending to an hour's length, 3 full days work is necessary. An hour's recording yields an average of forty typewritten pages with double spacing on a sheet 8½ by 11 inches. A typist of the Archives of Folk-lore has been busy at it for 6 months. She has transcribed exactly twenty rolls on about 800 typewritten pages. A part of these texts had already been sent, at the end of March 1949, to the National Museum. When the transcription is complete, the forty-four rolls for 1948 will presumably yield 1,500 pages of text.

The repertory of the folk-tale tellers is still very abundant and varied. We really have not exhausted the possibilities of any of our informants. M. Joseph (Palémon) Gauthier, of Saint-Irénée, alone, gave us fifteen folk tales, and furnished a list of as many more that he intended to tell. He died in February 1949.

The subjects of folk tales are varied: they include a number of types of traditional narratives. These could be classified into several groups, which are elsewhere familiar in the studies of folk literatures. They are: 1, tales and narratives concerning animals; some of these are etiological; 2, fairy tales or tales of marvels; those where the themes of supernatural interventions are used or where metamorphosis is in the forefront. To this type belong the largest number of tales we have recently recorded; 3, tales remaining within the scope or sphere of truth or possibilities; those without supernatural interventions. To this type belong the tales of the clever thief; 4, humorous stories of the *fabliaux* type or funny tales; these are also represented in our collection; 5, local legends, given as if the events had really happened; 6, last, the recollections of life in former days, voyages beset by suffering and tribulations, stories of hunting and fishing, and fights with the Indians.

In the margin of these records as it were, our notebooks are filled with information that explains the function of folk tales in the folk traditions of the farmers and the lumber people; for instance, the oral sources, either within the home or outside. In each folk tale, we note the mode of transmission, the reaction of the listeners, the importance of fairyland, and moral precepts, etc.

The value of this collection is unique, both for the quality of the informants and for the adequate recording of the materials. It is the first time, we believe, that a magnetic ribbon has been utilized in gathering folk tales and stories. Our documents are alive and invaluable. They will naturally help in further linguistic studies. Not only will they enable us to analyse the vocabulary in its contents, but they contribute the most important records for the study of phonetics and syntax; this was not achieved by the early transcriptions of casual manuscripts or of shorthand scripts. These materials may be utilized by the psychologist who wants to study human memory with the aid of formulæ and of *verbomoteurs* and oral texts. The students concerned with comparative literature will find here numerous themes and elements for comparison with other Canadian folk tales already recorded and published or with similar tales abroad. The 1948 collection enables us to state that Canadian folk-tale tellers in the past have added to the common stock a considerable number of folk themes (Motif-Index of Folk Literature).

Such is, in brief, an outline of the work done during the summer of 1948, and which we intend to follow up in 1949 with the stimulating encouragement of the National Museum of Canada.

THE RETURN OF THE SOLDIER HUSBAND

By François Brassard

The following is a study of a folk song selected from a group collected in the province of Quebec. Like most of this group, the folk song originated in France. It unfolds, in about thirty lines, a human drama familiar in many parts of Europe; that of the soldier away from home many years, and who has left behind a bride or a fiancée. He comes back only to find her married or about to be married. This subject has appealed to many writers, including Tennyson in *Enoch Arden*, Balzac in *Le Colonel Chabert*, Guy de Maupassant in *Le Retour*, and Zola in *Jacques Damour*. All of these have expanded it into backgrounds of their own choice.

This theme of the home-coming of the soldier has inspired more than one folk song. It has taken different forms and divergent endings, and has travelled over wide areas, even beyond the borders of France. All versions are well known in Canada. The analysis of this song, which is not quoted in full in this article, is intended to show only its pattern and ramifications, which are typical of many other older folk songs that have enjoyed wide popularity.

A long-absent husband comes back home to his wife, who believes him to be dead and has decided to marry again. This is the theme of the folk song cycle that is to be discussed.

In most of the variants or versions, the husband stays 7 years. This number conforms to a common folk-lore figure, which is usually three, four, or seven. It reappears whenever someone has been away for an unforeseen period of time. The beloved one, after so prolonged an absence, is assumed to be dead. This is known to have happened even in our time when news is easily transmitted. It was more likely to happen in centuries gone by when news was practically impossible to obtain.

It is not only the unknown hazards that disturb the mind of the departing soldier, but personal concern and jealousy, as is shown in the folk song, *The Return of the Soldier Husband*. The lover, before taking his departure for the army, declares to his young bride:

“Les Jeunesses du village viendront te fair’ l’amour
Ils te diront de temps en temps:
Pleurez pas tant pour votre amant,
Car il est mort au régiment”.¹

(Others will come and make love to you, saying, “Dont’ mourn for him, he has died fighting with his regiment”.)

In another version of the same song, the wife, upon his return, declares:

“J’ai tant reçu de fausses lettres
(I have received so much false news)”

Other versions go into more particulars:

“J’ai tant reçu d’méchantes lettres
Que tu étais mort, enterré”
(. . . that you were dead and buried.)

¹ From our collection No. 307.

Such deception was intended to weaken her ties and obtain her consent to a new union. Were she only betrothed, she was now to become the bride of another whom, however, she could not compare with the soldier she mourned; if married, as in the folk song cycle under discussion, she was to marry a second time.

The return of her fiancé or bridegroom happens at a crucial moment. As a regular feature of the song, he is not recognized at first. It is true that their life together may have been short-lived, yet their separation has not been so very long after all, only 7 years. A longer absence would have made the error more plausible. However, suffering, at times, may work havoc; it may change the features and cause one to age prematurely. Then again the length and manner of arranging the hair, a thick beard, where there was none, the way of dressing, all may help to hide one's identity. But to a maker of songs this makes no difference. He is interested only in a dramatic plot without measuring its episodes with a yardstick.

Sometimes, when confronted with each other, the former fiancé and sweetheart, or bride and groom, fail to remember each other. Then an incident, quite accidental, causes them to do so.

Often, however, the wandering soldier is the first to recognize his beloved; then to make certain that she will recognize him, he brings back some remembrance common to them both, or falls back on some bit of evidence that cannot fail. It is peculiar that less importance here should be attached to the facial and other features, than to casual marks of identification. But folk literature is not averse to such make-believe.

As soon as the truth is found out, the plot hastens on its way to its conclusion, either one way or another, according to the various forms of the song, which folk fancy has elaborated to suit itself.

In one form the true husband comes back at the very moment when the celebration of wedlock begins with a banquet. The study is restricted here to this particular version of the folk song.

To this branch belong a number of legends, stories, and songs from the period of the Crusades down to our time. The Crusader in a narrative learns somehow (at times from Satan himself) of his wife's betrothal, and hastens back to his homeland. His journey seems to have been speeded up by his supernatural helper with whom he has formed a pact. Once safely arrived in good time, he cunningly refuses to fulfil this pledge and manages to avoid the dismal consequences.

More idealized is a song on the same theme from the neighbourhood of Jallais. Here, the Seigneur de la Chaperonière has been abroad for 7 years, fighting the Moors, but has not sent home any word either good or bad. His wife's belief in his death leads her to remarry with great celebrations in the castle court. Suddenly during the wedding festivities, the chapel bells begin to ring of their own accord, when an unknown knight on horseback appears at the drawbridge. He is the lord of the land. Forcing his way in, he proceeds to the altar in the chapel to lay down a fragment of the Cross from the Holy Land. Informed of the impending remarriage of his wife, he identifies himself.¹

¹ Sébillot, *le Folklore de France*, Paris, 1904, T. IV, pp. 341 and following.

In a legend from Picardy the Marquis of Créquy has gone away to the Crusades. In Palestine he is taken prisoner, which keeps him away from his wife for 20 years. At long last she decides to take a second husband, but her plans are nipped in the bud by the miraculous reappearance of her husband. It is said the prisoner's chains are still preserved in the church of Notre Dame du Hamel near Grandvillers (Oise).¹

Seldom in the song is the returning husband delayed in his homeward journey, or unsuccessful in winning recognition.²

This return of the Crusader is the theme of so many legends and songs, it would be impossible to list them here. Only one version will be examined briefly.

Scarcely is he married when the hero of the song is called to arms and is kept away from home a long time. When, finally, he returns (home) he learns that his wife is about to remarry. In most of the variants it is from the hostess at the first house he visits that he learns the news. He goes to the house where the wedding is being celebrated and succeeds in making his way in. He engages in conversation with his relatives, who, like his wife, fail to recognize him. Invited to the banquet table, he boldly sits beside the bride, and proceeds, to the astonishment of the assembled company, to make himself known by means of dice or playing cards. Then when he mentions the various jewels he gave his wife on their marriage, he is recognized as the true husband.

Two features will, at once, distinguish this form of the *Return of the Crusader*: the soldier is engaged in a nameless war, and the story has none of the supernatural about it. What distinguishes it is the ingenious way in which he establishes his identity. Although he is recognized from the first by the hostess, he still remains a stranger to the wedding guests, including his relatives, and his own wife. Seated at the banquet table, he eats and drinks copiously, without arousing suspicion. Once his hunger and thirst are satisfied, he speaks of the rings and diamonds he lavished upon his bride, which brings him belated, but timely, recognition. The conclusion of this version of the folk song, where everything ends well, is one that always pleases simple folk.

Before reviewing the Canadian versions, reference will be made to a few collected in France.

(a) The Smith version, from Velay and Forez, 1880.³ Here the soldier husband is named Monsieur de la Batie, who is called to the army 3 days after his marriage. On his return home he uses the trick of (the) playing cards to identify himself, and his wife cries out:

“Voilà mon pauvre homme, celui que j'ai tant aimé!”
 “Here is my poor husband, whom I have loved so dearly!”

His own words in answer are:

“Qui a perdu sa femme peut bien l'aller chercher:
 J'avais perdu la mienne, et je l'ai retrouvée!”

“Whoever has lost his wife cannot help but seek her
 Mine I had forsaken, and I have found her again.”

¹ *Revue des Traditions populaires*. T.X, (1895), p. 371.

² *Ibid.*, T. XIII (1898), p. 425.

³ *Romania* T. IX. (1880), p. 289.

The would-be husband consoles himself with the following advice to others:

“Ne faites pas comme moi, garçons à marier,
Ne faites pas de veuve, crainte de vous tromper
Mais prenez donc des filles de bonne volonté.”

“Let young men like me, seeking a bride,
Never look at a widow, for fear of being mistaken,
But choose a maiden, who shows she is willing.”

(b) The Legrand version, from Normandy, 1881¹, resembles our Canadian form more closely than any other. The husband enlists the first day after his wedding.

(c) The Fleury version, also from Normandy, 1883.¹ In this version the summons to arms occurs on the very day of the marriage. “In the fifth stanza, upon his return home, his mother greets him as she would any unknown wanderer:

“Mon brave militaire, entre ici dedans!”
“My brave soldier, you are welcome here!”

In this as in the preceding version the wedding guests rebuke him, but the wife, recognizing him, exclaims:

“Je croyais être veuve et voilà mon mari.”
“I thought I was a widow, but here my husband has come back.”

In the Fleury text, a stanza naïvely expresses a contrast, when the wife returns to her first husband.

“Le second de ses hommes s’en fut pour l’embrasser.
Retire-toi d’ici, vieux traître, retire-toi d’ici.
Je suis toujours la femme de mon premier mari.”

“The second husband turns around to kiss her.
Go away old betrayer, go away at once.
The sweetheart of my first husband I am still.”

Well known as this song is in France, it seems that its true home is now in Canada. It can be found almost everywhere along the St. Lawrence. I myself have recorded twelve versions. In brief they contain the following characteristics:

The call to arms or conscription on the day of the wedding. Six of them quote Louis for the king’s authority, uttering the name in two syllables “Lo-ys” in the old style. This detail also occurs in other songs of the same type.

The bride and the guests weep at the news of the summons and at the departure of the soldier, who tries to console them with assurances that he will come back.

In other versions the wedding occurs at an inn. This location prepares the ground for the soldier’s return to the same place, as an ordinary guest.

The bride is too busy to concern herself with him when he reappears, but her relatives, or occasionally his own, ask that he be shown some hospitality.

Several versions mentioned a casket that he brings back containing gold and silver.

¹ *Romania*. T.X. (1881), p. 374.

The second husband as a rule is the one who tries to get rid of the newcomer:

- Tout doux, tout doux, gendarme, ne vous pressez point tant.
 - La marié' que voilà ne vous appartient pas;
 - Oh! C'est ma bien-aimé', non, non, tu l'auras pas.
- (Soldier, off with you! Don't try to meddle here.
The bride here does not belong to a mere passer-by.
She is my own beloved. Not yours, I assure you!')

A few folk singers interpret this last line as being the claim of the true husband.

At the conclusion of the French versions mentioned above, the young woman resigns herself to the turn of affairs, with the remark:

- Je croyais être veuve et voilà mon mari.
- (I thought I was a widow, and here is my husband.)

But our Canadian records have given this ending a twist of their own, with a touch of humour:

- Ce matin, j'étais veuve, ce soir, j'ai deux maris.
- (This morning I was a widow, so I thought, but now I have two husbands.)

Elsewhere, the same line takes another turn:

- Oh! oui, c'est mon mari, j'ai le cœur réjoui.
- (Oh yes! he is really my husband, to my heart's delight.)

Here are other details in the numbered Canadian versions. No. 102: The bride, unable to receive him, sends him to his own mother whose habit it is to give hospitality to soldiers (in memory of her son). No. 103: The bride greets him without knowing him. No. 126: The bridegroom was married at 15 years of age, and is 6 years away. So he is still very young when he comes back. No. 143: The wedding party is dismayed when a mere soldier, at her wedding table, tries to fascinate her. She runs upstairs to her room, to bring back her rings and diamonds. Nos. 240, 241: A pretty maid and her sweetheart wish to unite their lives. In the folk-lore of northwestern France as in Canada, love leads naturally to marriage. No. 242: The stranger is granted hospitality, without hesitation. As soon as his wife is made aware of his identity, she is asked to fetch the head-dress (*coiffures*), the rings and the diamonds, of her first wedding day. No. 243: The returning husband makes himself more welcome by producing a war trophy, gold or silver.

- Mis la main dans ma poche, tirai dix mille francs:
 - Voilà la récompense du nouveau marié.
- (Puts a hand in his pocket, pulls out ten thousand francs.
Here is your bounty from a desirable bridegroom.)

But this recent interpolation is too awkward to be popular. No. 304: The returned husband now is an officer. And the first (2) stanzas are in the narrative form. No. 305: The lover has courted his sweetheart when she was only 15. Now he has come back to marry her at 20. A line prefaces his story:

- La femme que j'ai pris' me caus' bien de l'ennui.
- (The girl I have chosen has caused no deep chagrin.)

He is called up the day after the wedding. In a few odd stanzas, his personality can be traced to other songs of the same type, like a fugitive as it were:

10. Tous les gens de la noce ont été fort surpris.
Chacun, l'un après l'autr', sont à lui demander:
— Lequel des deux maris allez-vous adopter ?
11. Mon père aussi ma mère veul'nt que je répondis:
— Le soldat que voilà, c'est mon premier mari,
C'est lui que je choisis, ce soir et pour la vi'.
12. Tous les gens de la noce retourn'nt à leur foyer.
— Oh! C'est un grand miracl' qui vient d'arriver là.
Que Dieu béniss' les femm's, surtout cell' du soldat!

All the guests at the feast were struck with surprise. They inquire of each other—"Which of the two will you choose? My father as well as my mother want me to reply,—This soldier is truly my husband, my first. I shall go back to him, tonight and for the rest of my life. There is nothing left for the guests but to go back home—Oh! It's really a miracle that has happened under this roof. May God bless all wives. A soldier's first of all!"

Rhythmic Form. Common to all versions or variants: stanzas consisting of three lines, twelve syllables each, with mute cæsura and masculine rhymes. But the cæsura of the second and third lines is, inversely, masculine, and the ending feminine or mute. A number of versions and stanzas equally tend in the three lines to concur all three in a single rhyme, or again to have an odd first line, whereas the other two belong together.

The Tunes. Of all our songs in narrative form, it counts among those endowed with the most varied airs and rhythms. These are of three types, and the individual tunes in each often vary markedly from each other. Songs under forms other than the narrative, however, in time became even more diversified.

The song of the *Return of the Soldier Husband* has travelled a great deal, or rather, it has enriched itself in the course of its wanderings. Other folk songs are known to have expanded likewise, but without the help of more than one type of melody. Because each of the three types of this song is to be found full of spirit and vitality in our country, it is obvious that its ramifications are the outgrowth of time.

VASCULAR PLANTS OF NUEL TIN LAKE, NORTHWEST TERRITORIES

By A. E. Porsild

A large collection of vascular plants was made by Dr. Francis Harper of Mount Holly, N.J., in 1947, near the northwestern extremity of Nuel tin Lake in the southwest corner of Keewatin district, which comprises the continental part of the Northwest Territories of Canada north of the 60th parallel of latitude, between the west coast of Hudson Bay and the 102nd meridian.¹

This collection of 300-odd numbers, each represented by 3-4 duplicates, was entrusted to the writer for the preparation of the following annotated catalogue. One hundred and thirty-four species and varieties are represented in the collection. Most of the collections were made within 2 miles of the mouth of Windy River. About 50 numbers were collected at Josie's Bay in July, and about 16 in the vicinity of Simons Lake in October.

PLATE XII



Northwestern extremity of Nuel tin Lake. Looking N.N.E. over Windy Bay from near the summit of Windy Hill, several hundred feet above the bay.

¹ Dr. Harper's work, covering various branches of biology, was supported by the Arctic Institute of North America with funds supplied by the Office of Naval Research.

All the specimens are exceptionally well collected and preserved and Dr. Harper is to be congratulated not only upon the fine quality of his material but also on his carefully recorded ecological data, which accompany each sheet and contribute much toward making the naming and annotation of the collection an enjoyable and profitable task. The first set of specimens

PLATE XIII



Looking south-southwest from Josies Hill.

is in the herbarium of the Academy of Natural Sciences of Philadelphia, the second in the herbarium of the National Museum of Canada, Ottawa. Additional and less complete sets have been presented by Dr. Harper to the universities of Minnesota, Michigan, Wyoming, and Pennsylvania, the herbarium of the New York Botanical Garden, Catholic University of America, Pennsylvania State College, and the United States National Herbarium, Washington, D.C.

Dr. Harper has kindly contributed the following notes on the physiography and vegetation of the Nueltin Lake area:

"Nueltin Lake lies at an elevation of about 875 feet above the sea. Some of the hills at its northwestern extremity rise about 500 feet higher, with cliffs and talus along their sides. The hills and ridges are well studded with boulders up to a rod or more in diameter. The commonest rock is a pink granite or granite-gneiss with a few zones of older schist. The soil on most of the uplands is coarse and gravelly; but here and there are sandy

eskers. Many of the depressions between the ridges are occupied by either wooded muskegs or open bogs, the latter generally having a profuse growth of sedges. Lakes, rivers, creeks, and tundra ponds occupy perhaps 25 per cent or more of the surface.

"The Barren Grounds cover probably 80 to 90 per cent of the land. The principal trees of the forest tracts are black spruce and tamarack, which grow both in the muskegs and on the upland slopes; most of them are no more than 25 or 30 feet high. White spruce is much less common, while canoe birch and balsam poplar are rare. Dwarf birch, willow, and the berries of such shrubs as *Vaccinium Vitis-Idaea*, *Vaccinium uliginosum*, and *Empetrum nigrum* are important items in the food of various mammals and birds. Lichens fairly cover the earth, the rocks, and the trees."

From the retarded development of some of the specimens and especially from the phenological notes contributed by Dr. Harper, it appears that the season of 1947 was a late one in the Nuelin Lake area. Thus, on June 10 *Empetrum nigrum* was still in the hibernal stage, and on June 17 the male catkins of *Salix planifolia* had not yet dropped their bud scales although 5 days later expanded flowers appeared on *Salix anglorum*; not until July 6 were the first flowers noted on *Saxifraga tricuspidata*.

A number of the species represented in the collection evidently are near their northern limit and in 1947 did not produce fruits (*Epilobium angustifolium*, *Rubus strigosus*).

The Nuelin Lake area shows evidence of heavy glaciation; the rocks are Precambrian and the landscape, generally speaking, is lacking in highly diversified plant habitats. It is to be expected, therefore, that the local flora should be a rather poor one, lacking a number of species that require specialized and favoured habitats.

Comparatively little is known of the botany of Keewatin district. Best known is the west coast of Hudson Bay where important collections of plants were made, as follows:

- (1) J. M. Macoun collected between the 60th parallel and Wager Bay, in 1910.
- (2) Birket-Smith and other members of the Danish Fifth Thule Expedition collected plants along the Hudson Bay coast, and also on Baker Lake and on Yathkyed Lake, in 1922-4. The collections were reported upon by Grøntved (1936).
- (3) M. O. Malte collected at Chesterfield in 1928.
- (4) A. E. Porsild collected at Eskimo Point, Tavane, and Chesterfield, in 1930.
- (5) W. C. Gussow made a small collection between latitude 60 degrees and 62 degrees North, in 1932 (1933).
- (6) G. Gardner collected some plants at Chesterfield in 1933 (1937).
- (7) N. Polunin collected at Chesterfield in 1936. All vascular plants known to him to occur along the Hudson Bay coast of Keewatin are included in his report (1940).
- (8) A. Dutilly collected at Chesterfield in 1936.

The only comprehensive collections from the interior were made by the writer (1936b) who, in 1930, spent about a month making a botanical reconnaissance of the Yathkyed Lake basin, the lower Kazan, and Baker Lake. He also spent a few hours collecting plants on the upper Tha-anne River. The collection, which comprises some 500-odd numbers, is still unpublished.

Dr. Harper is the first to collect plants in that small part of Keewatin lying within the forested area and it is not surprising, therefore, that his carefully made collection of 134 species and major varieties should contain no less than 36 forest species never before collected in Keewatin.

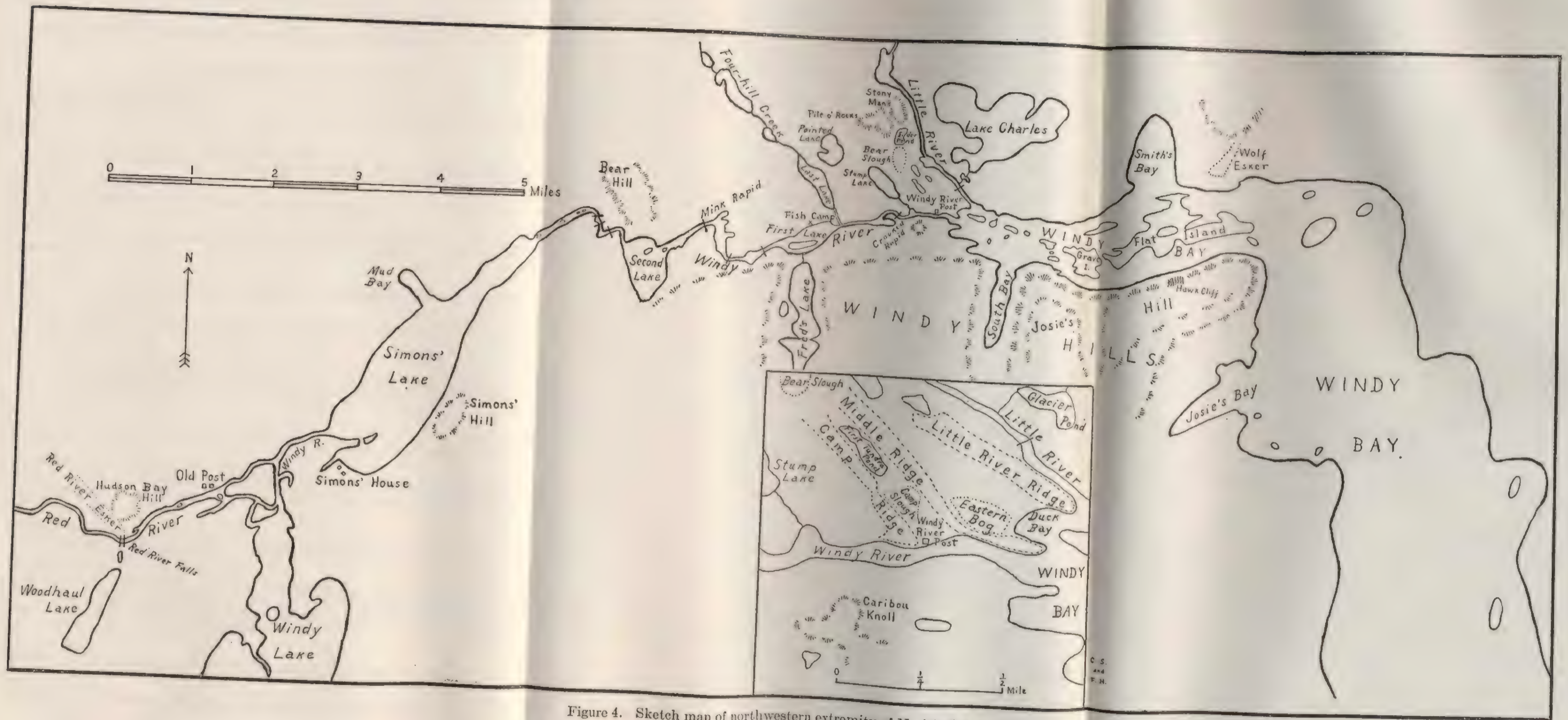


Figure 4. Sketch map of northwestern extremity of Nueltin Lake.

By interpolation based upon records in the National Herbarium of Canada from adjacent parts of Keewatin, Mackenzie, and Manitoba the vascular flora of the forested southwest corner of Keewatin may be safely assumed to number not less than 300 species. Including Dr. Harper's collection, records in the National Herbarium now show that 334 species and major varieties of vascular plants actually have been collected or reliably recorded in the District of Keewatin.

In the following catalogue the species first collected in the District of Keewatin by Dr. Harper are preceded by an asterisk.

ANNOTATED LIST OF PLANTS

Dryopteris fragrans (L.) Schott.

Windy River, among rocks on a hill, No. 2359; Josie's Bay, on slope with southern exposure, No. 2303.

D. fragrans (L.) Schott. var. *remotiuscula* Kom.

Windy River, in tract of stunted spruce, No. 2432; Windy Bay among rocks, No. 2488.

**D. Robertiana* (Hoffm.) Chr.

Windy River, among large boulders on rocky slope, Nos. 2361 and 2510.

Equisetum arvense L.

Josie's Bay, on tussocks in a spruce muskeg, Nos. 2309 and 2254; Windy River, in sphagnum bog, No. 2458.

E. limosum L.

Windy River, in edge of tundra pond in 4 to 10 inches of water, No. 2378.

E. scirpoides Michx.

Windy River, low barrens adjacent to spruce muskeg, No. 2472; same place, in black spruce muskeg, No. 2240.

E. sylvaticum L. var. *pauciramosum* Milde.

Windy River, burnt-over spruce muskeg, Nos. 2244 and 2389; mouth of Little River, among mosses in damp thicket by river, No. 2447; Josie's Bay, abundant in open, sloping bog, No. 2308.

Lycopodium annotinum L. var. *alpestre* Hartm.

Windy River, beneath alder bushes, No. 2232; Josie's Bay, in spruce woods, No. 2313.

L. annotinum L. var. *pungens* (La Pylaie) Desv.

Red River, beneath dwarf birches, No. 2537; mouth of Windy River, in sphagnum on muskeg, No. 2212; same place, in spruce muskeg, No. 2527; Little River, beneath dwarf birches, No. 2448.

**L. clavatum* L.

Windy River, sterile specimens in alder and birch thickets on June 27, No. 2233.

**L. complanatum* L. var. *canadense* Viet.

Red River, on sandy and rocky hill beneath dwarf birches, No. 2542; Windy River, open river-bank, sterile specimens on June 27, No. 2234; island in Windy Bay, southern exposure, fertile specimens on September 10, No. 2485; Four-hill Creek, beneath dwarf birches in sparse spruce timber, No. 2396.

Lycopodium Selago L.

Windy River, apparently rare locally, on damp barrens, No. 2208.

Picea glauca Voss.

Windy River, barren, rocky hill, Nos. 2262, 2263, and 2420.

On July 4, new cones 8 mm. long are forming whereas those of last year still remain on the trees (Nos. 2262 and 2263). In a later collection made on August 12 the new cones are almost mature and contain fully developed seeds (No. 2420). The cones of the previous year are small, averaging about 25 mm. in length, whereas those of this year are up to 40 mm. long.

From the abundance of old cones on the ground, as well as from the presence of new cones on the trees, it would appear that seed production is good in the Nueltin Lake region, although Dr. Harper noted that the white spruce is very scarce and local and much less common than is black spruce. At the mouth of Windy River the largest tree noted was about 35 feet high.

P. mariana (Mill.) B.S.P.

Windy River, No. 2498. Low, stunted trees about 10 feet high, bearing small but fully developed cones on September 16.

Dr. Harper noted that black spruce is the commonest tree in the area.

Larix laricina (Du Roi) Koch.

Windy River, trees 15 feet high on a mound by a sedge bog, No. 2218. On June 17 the trees had not yet come into leaf. The specimens bear fully developed and expanded cones of 1945 and 1946.

**Juniperus communis* L. var. *montana* Ait.

Josie's Bay, depressed shrubs on rocky slope with southern exposure, growing near clump of spruces, No. 2295; Four-hill Creek, in sparse spruce timber, No. 2401; Red River, on sandy places adjacent to esker, No. 2543. On August 8 the fruits were fully mature. Noted in only four small colonies in the entire region.

Sparganium hyperboreum Laest.

Windy River, sterile specimens on August 4, in 2½ feet of water, No. 2373; same place, sterile specimens on September 4 in shallow edge of a little bay, on Windy River, No. 2479.

**Potamogeton Friesii* Rupr.

Windy River, No. 2558. The specimen consists of a single winterbud found in a mass of *Nitella* sp. (No. 2558-A), entangled in a gill-net in 6 feet of water in expansion of river, on October 30.

P. alpinus Balbis ssp. *tenuifolius* (Raf.) Hult.

Windy River, common in shallow edge of a little bay, sterile specimens on September 4 in 4 to 12 inches of water, No. 2478.

**P. praelongus* Wulf.

Windy Bay, sterile, floating specimens taken from fish-net on August 11, No. 2417.

P. vaginatus Turcz.

Windy River, sterile, floating specimens on October 30, taken from fish-net in about 12 feet of water, No. 2556.

**Triglochin maritimum* L.

Windy River, rare in open bog on border of tundra pond, No. 2354.

Hierochloa alpina (Sw.) R. & S.

Smith Bay, on sandy esker, No. 2210; Windy River, on gravelly barrens, No. 2405. Common in each place.

Agrostis borealis Hartm.

Windy River, common locally on rather bare, gravelly hill, No. 2406.

**A. scabra* Willd.

Mouth of Windy River, common locally on low tundra along caribou trail, No. 2515.

Calamagrostis canadensis (Michx.) Beauv.

Little River, flowering specimens, on August 26, when common in willow thickets by river, No. 2450; mouth of Windy River, on sphagnous border of tundra pond, No. 2377, and No. 2205 on tussocks in a sedge bog; same place, predominant species in a riverside meadow, No. 2367.

C. lapponica (Wahlenb.) Hartm. var. *nearctica* Porsild.

Mouth of Windy River, rare on tussock in open sphagnum bog, No. 2435.

C. purpurascens R. Br.

Windy River, specimens in beginning anthesis on July 8, on gravelly ridge by the river, No. 2277; same places, very common on gravelly ridge, No. 2357; island off mouth of Windy River, No. 2484; Red River, 3 miles southwest of Simons Lake on Windy River, No. 2536.

Trisetum spicatum (L.) Richter var. *Maidenii* (Gand.) Fern.

Windy River, one mile above mouth, in open dwarf birch thicket, No. 2520.

Poa alpigena (Fr.) Lindm.

Windy River, in burnt-over spruce woods, No. 2501; abundant on low sand dune by shore of Simons Lake, No. 2535; Little River, along caribou trail through dwarf birches, No. 2449.

P. arctica R. Br.

Windy River, common in burnt-over spruce woods, No. 2391.

P. glauca M. Vahl.

Windy River, gravelly and rocky ridge, No. 2376; Four-hill Creek, on a mossy boulder, No. 2431; same locality on rocky ledge, No. 2400; Windy Bay, on rocks at Hawk Cliff, No. 2494; Josie's Bay, on rocky southern exposure, No. 2302.

Arctophila fulva (Trin.) Rupr.

Windy Bay, forming an extensive bed in water about 3 feet deep, flowering specimens on August 4, No. 2372; in shallow, still water half a mile above mouth of Windy River, sterile specimens on September 4, No. 2476.

Festuca brachyphylla Schultes.

Hawk Cliff, 3 miles east of Windy River, No. 2493; Windy Bay, gravelly summit of a hill, No. 2322-C.

**Hordeum jubatum* L.

Rocky ground near building at "Old Post" on Red River, No. 2549.

Eriophorum angustifolium Roth.

The species is probably common throughout the area. The following series from two sedge bogs near the mouth of Windy River shows the seasonal development: No. 2221 in beginning anthesis, but new leaves barely emerged, on June 20; No. 2275 with the upper spikelets in post-anthesis and with fully developed culms and leaves on July 8; No. 2348 with fully ripe achenes on July 23. Same locality on marshy border of a litter tarn, No. 2363.

**E. brachyantherum* Trautv.

Josie's Bay, a westerly arm of Windy Bay, abundant on tussocks in an open hillside bog, No. 2293.

**E. russeolum* Fr. var. *leucothrix* (Blomgr.) Hult.

Windy River, very abundant in sedge bogs, Nos. 2274, 2352, and 2402.

E. spissum Fern.

Windy River, on tussocks in an open bog with dwarf birch, No. 2256.

Scirpus caespitosus L. var. *callosus* Big.

Windy River, flowering specimens on June 24 on boggy border of a sedge bog, No. 2227; same locality, border of boggy tarn, No. 2512; Josie's Bay, in spruce muskeg, No. 2290.

Carex anguillata Drej. See Fern. in *Rhodera* 36:91 (1934), and Porsild in *Sargentia* 4:22 (1943).

Windy River, abundant in riverside meadow, among *Calamagrostis canadensis*, No. 2368; same locality, on sphagnum in a spruce muskeg, No. 2514.

The specimens in the present collection are a good match for the series in the National Herbarium of Canada, which by the writer, i.e., was referred to *C. anguillata*.

C. aquatilis Wahlenb.

Windy River, flowering specimens on July 28 on marshy border of a little tarn, No. 2362; same locality, specimens with fully ripe achenes on August 20 at border of open bog, No. 2437; in a wet riverside meadow, No. 2523; southwest end of Simons Lake, No. 2532; near mouth of Little River, in water 1 foot deep, No. 2371; Josie's Bay, on sphagnum tussocks in spruce muskeg, No. 2316.

By the collector, noted as abundant at all stations cited above.

**C. canescens* L.

Windy River, specimens with fully mature spikelets on September 23 at border of sedge bog, No. 2517.

C. chordorrhiza Ehrh.

Windy River, specimens in beginning anthesis on June 24, on border of bog, No. 2228; same locality, in full flower on July 8, No. 2276; and on July 26 with fully ripe achenes, No. 2355a; same locality on August 20 and September 16 with ripe achenes dropping, Nos. 2439, 2497, and 2516; "Old Post" on Red River, abundant in open bog, No. 2544.

According to the collector's notes *C. chordorrhiza* is a common or even dominant species wherever found in the Nueltin Lake area.

- **C. concinna* R. Br.
Four-hill Creek, 2 miles above mouth of Windy River, at base of rock ledge, No. 2399.
- **C. disperma* Dew.
Josie's Bay, young, poorly developed specimens on July 18 in a muskeg on tussocks beneath spruces, No. 2335.
- C. glacialis* Mack.
Windy River, common on sandy and gravelly hillock, Nos. 2270 and 2322b.
- **C. leptalea* Wahlenb.
Windy River, common locally on sphagnous border of tundra pond, No. 2383.
- **C. limosa* L.
Windy River, very abundant locally in open bog on border of tundra pond, No. 2355b.
- C. rotundata* Wahlenb. See Porsild in *Sargentia* 4 : 24 (1943).
Windy River, where it was noted as extremely abundant in sphagnum and sedge bogs, Nos. 2403 and 2438; same locality, common on damp border of a boggy tarn, No. 2511; "Old Post" on Red River, in open bog, No. 2545.
According to the collector's notes, *C. rotundata* was common to abundant locally. The earliest collections were made on August 8 (No. 2403) when the species had fully matured fruits.
- The present large series of well prepared and typical *C. rotundata* greatly extends the known range of this Old World species, which in North America was known to extend from Alaska east only to the mouth of the Mackenzie (cfr. Porsild, 1943). In view of the present series the identity of an earlier collection from the lower Kazan River (Porsild, No. 6014) need no longer be questioned.
- C. saxatilis* L.
Windy River, where it was abundant locally in a sedge bog, No. 2369.
- C. scirpoidea* Michx.
Two miles above mouth of Windy River, rare in spruce and tamarack bog, No. 2428; Windy Bay, flowering specimens July 2 on north slope of Josie's Hill, No. 2250; in a spruce muskeg in Josie's Bay, No. 2286.
- C. supina* Willd. ssp. *spaniocarpa* (Steud.) Hult.
Windy River, on sandy and gravelly hillock growing with *C. glacialis*, No. 2270a; rocky ridge in southwest part of Windy Bay, No. 2552.
- **C. tenuiflora* Wahlenb.
Windy River, common in open sphagnum bog, No. 2345.
- C. Williamsii* Britt.
Windy Bay, gravelly top of a hill, No. 2322a. The specimens, which are very small, with culms from 2 to 5 cm. high, on July 17 had fully mature fruits.
- Juncus albescens* (Lge.) Fern.
Josie's Bay, common on muck in an open bog, No. 2307; Windy River, in damp river-side meadow, No. 2474.
- Luzula confusa* Lindb.
Windy Bay, 4 miles east of Windy River, No. 2323; Windy River, common on gravelly hill on barrens, No. 2407.
- L. parviflora* (Ehrh.) Desv.
Windy River, uncommon in a spruce muskeg, Nos. 2470 and 2477.
- Tofieldia palustris* Huds.
Windy River, very common in wet *Carex* bog where, on June 28, the new growth had barely started, No. 2238; Josie's Bay, damp, rocky barrens, flowering specimens on July 11, No. 2288.
- Habenaria obtusata* (Pursh) Richards.
Josie's Bay, uncommon in spruce and tamarack muskeg, Nos. 2317 and 2340.
- **Populus Tacamahacca* Mill.
Josie's Bay, 22-foot high tree along stream near head of bay, where it was fairly common locally, No. 2330.

Salix anglorum Cham.

Windy River with flowering male aments on June 22, on low barrens, No. 2224; same place, prostrate shrubs on rocky river bank, No. 2422; same place, on sphagnum tussocks in a bog, No. 2440; Josie's Bay, on boggy hillside, Nos. 2249 and 2282.

S. arctophila Cockr.

Windy River, trailing shrub 8 to 10 inches high in a spruce muskeg, with immature fruits on July 8, No. 2278.

S. glauca L.

Windy River, flowering male aments on July 5 in burnt-over spruce muskeg, No. 2266; same place, low, erect shrubs fruiting on September 16, No. 2500; island in Windy Bay, on gravelly and rocky ridge on barrens, No. 2483.

S. herbacea L.

Windy River, abundant locally on damp river bank, No. 2505.

S. planifolia Pursh.

Windy River, 12-foot high bushes in a sedge bog, with large but still unopened male aments on June 17, No. 2217; same specimen with young leaves on July 8, No. 2279; same locality, 9-foot bushes in boggy streamside thicket, No. 2502; "Old Post" on Red River, in willow thicket, No. 2548; north slope of Josie's Hill, low erect bushes, No. 2251; Josie's Bay, low, erect bushes in a spruce and tamarack muskeg, No. 2318, with fully mature fruits on July 16; mouth of Little River, 8-foot bushes in a thicket bordering the river, No. 2443.

Apparently the principal thicket-forming willow in the Nueltin Lake area.

S. reticulata L.

Josie's Bay; noted as common locally on a spruce-covered slope, No. 2285.

S. Richardsonii Hook.

Josie's Bay, apparently not common on spruce-covered slope where it grew in clumps 5 feet high, No. 2284.

Myrica Gale L.

Windy River, local or rare in sphagnum border of a little tarn among the Windy Hills, No. 2364.

Betula glandulosa Michx.

Windy River, hilly, gravelly barrens where specimens collected on June 11 were still in winter condition and with last season's fruiting aments still intact, No. 2209; same place, in anthesis with young leaves fully expanded on July 6, No. 2268; same locality, August 31, with autumn foliage, No. 2457. According to the collector's notes *B. glandulosa* is a dominant species on dry, gravelly and rocky barrens.

**B. occidentalis* Hook.*B. fontinalis* Sargent.

Windy River, rare on summit of rocky and gravelly ridge where 4-foot high, erect bushes were noted growing adjacent to prostrate *B. glandulosa*, No. 2351. Young fruiting aments on July 26.

B. papyrifera Marsh var. *nealaskana* (Sarg.) Raup.

Windy River, 4-foot bushes with young, not fully expanded leaves on July 4, No. 2258; same locality, on border between barrens and willow thickets, 18-foot bushes, 3-inch diameter, on August 12, with almost mature aments, No. 2418.

Noted by the collector as rare or occasional in the area.

Alnus crispa (Ait.) Pursh.

Mouth of Little River, 6- to 10-foot bushes with fully expanded male and female aments and expanding leaf-buds on June 23, No. 2225; Windy Bay, on July 2 and 4 with young leaves partly expanded, Nos. 2252 and 2257; mouth of Little River, low bushes, on August 27, with fully mature fruiting aments, No. 2454; Red River, 3 miles southwest of Simons Lake, October 20, in winter condition, No. 2541.

A common shrub that in sheltered places forms thickets 6 to 10 feet high.

**Geocaulon lividum* (Richards.) Fern.

Four-hill Creek 2 miles, above mouth of Windy River, common locally in sparse spruce forest, No. 2394.

Polygonum viviparum L.

Windy River, in open muskeg, No. 2341; same locality, in riverside meadow, No. 2429. Probably common throughout the area.

Stellaria calycantha (Ledeb.) Bong.

Windy River, in spruce muskeg and sphagnum bog, Nos. 2388 and 2468a.

S. longipes Goldie

Windy River, common in wet river meadow growing beneath tall grasses, No. 2423.

S. longipes Goldie var. *Edwardsii* (R. Br.) Wats.

Island in Windy Bay, on gravelly and rocky ridge, No. 2487; Josie's Bay, rocky barrens, Nos. 2289 and 2301; north entrance to Josie's Bay, No. 2315; Little River, in a barren area near its mouth, No. 2375.

Arenaria humifusa Wahlenb.

Windy Bay, gravel area on rocky hill in barrens, No. 2314.

A. uliginosa Schleich.

Two miles above mouth of Windy River on laminated rock in black spruce woods, No. 2430.

Anemone Richardsonii Hook.

Josie's Bay, where fairly common in a muskeg, in full flower, July 11, No. 2283.

Ranunculus lapponicus L.

Josie's Bay, flowering specimens July 13 on sphagnum mounds in a tamarack and spruce muskeg, No. 2297.

**Corydalis sempervirens* (L.) Pers.

Windy River, flowering, vigorous specimens on July 22 in burnt-over spruce woods, No. 2343.

Arabis arenicola (Richards.) Gel.

Windy River, on rocky ridge in the barrens, No. 2272.

Saxifraga tricuspida Rottb.

Windy Bay, in cleft in rocks at Hawk Cliff (a sterile shade form with trailing, much elongated stems), No. 2491; typical specimens, same place, No. 2489; mouth of Windy River, No. 2261; same locality, first flowering specimens noted on July 6, No. 2269; same locality, fruiting specimens, August 12, Nos. 2421 and 2553; Windy Bay, on north-facing escarpment, No. 2324. Apparently common and the only saxifrage collected or noted in the area.

**Mitella nuda* L.

Josie's Bay, locally abundant on dry hummocks in muskeg beneath black spruces, No. 2333.

Parnassia Kotzebuei Cham. & Schlecht.

Windy River, tall specimens on sphagnum border of a sedge bog, No. 2380; same locality, in open muskeg, No. 2342; same locality, dwarf specimens on low, wet barrens, No. 2358; in a dwarf birch thicket, No. 2521.

P. palustris L. var. *neogaea* Fern.

Windy River, common in a river meadow, No. 2452.

**Ribes triste* Pall.

Josie's Bay, flowering specimens on July 18, in a spruce and willow muskeg, No. 2339; 2 miles above mouth of Windy River, No. 2427; Windy River, fruiting sparingly on September 2, No. 2469.

Rubus acaulis Michx.

Josie's Bay, flowering specimens on July 12 on tussocks in spruce and tamarack muskeg, No. 2292; same locality, along a stream, No. 2334; mouth of Windy River, where it fruited sparingly on September 4-10, Nos. 2471 and 2480.

R. Chamaemorus L.

Windy River, first flowers on July 1, on sphagnum tussocks in a sedge bog, No. 2248; mouth of Little River, No. 2255; Kazan River, below Ennadai Lake, almost mature fruits on August 10, No. 2411.

**R. strigosus* Michx.

Josie's Bay, sloping spruce and willow muskeg along a stream, No. 2332; 2 miles above mouth of Windy River, on rocky ledge, No. 2395; Windy River, first flowering on July 24 in spruce and alder thicket, No. 2350; same place on September 2 with undeveloped abortive fruits, No. 2465.

Potentilla norvegica L.

Windy River, a single specimen noted in a grassy river meadow, No. 2436.

P. palustris L.

Windy River, in a wet sedge bog, No. 2382; same place with autumn coloured leaves and mature fruits on September 1, No. 2459.

Astragalus alpinus L.

Windy River, where it was common among dwarf birch and blueberry bushes, No. 2366.

Empetrum nigrum L.

Windy River, on hilly barrens, on June 10. The flower buds are still in the hibernal stage, No. 2207; same locality, on August 14 with fully formed berries, No. 2426. Noted as an abundant species on rocky barrens.

Viola pallens (Banks) Brainerd.

Josie's Bay, common in sphagnous spruce and willow swamp along a stream, flowering on July 18, No. 2336; Windy River, fruiting specimens on August 20, No. 2442.

Epilobium angustifolium L.

Windy River, on a rocky hill first flowers noted on July 28, No. 2360; same place, more luxuriant specimens in clearing by old campsite, No. 2370; same locality, in a bog, No. 2464. A late-flowering species that in the Nueltin area probably does not mature seeds except in favourable seasons. No. 2464 shows unopened frost-killed flower buds.

E. latifolium L.

Josie's Bay, common locally on rocky barrens, Nos. 2287 and 2312.

E. palustre L.

Windy River, in wet, sphagnum border of tundra pond, No. 2353; same locality, in a birch and willow bog, No. 2467; same locality, on September 16, in hibernal stage, No. 2496.

Hippuris vulgaris L.

Windy River, half a mile above the mouth, on shallow edge of a bay in water 4 to 12 inches deep, No. 2475.

Pyrola grandiflora Rad.

Josie's Bay, common locally and in full flower on July 12, on hilly, rocky barrens, No. 2294; Windy Bay, 4 miles east of Windy River, No. 2325; Red River, 3 miles southwest of Simons Lake on Windy River, No. 2539.

**P. minor* L.

Windy River, uncommon on sphagnous border of tundra pond, in flower on August 5, No. 2379.

P. secunda L. var. *obtusata* Turcz.

Windy River, on rocky or gravelly ridges beneath dwarf birches, Nos. 2419 and 2522. Noted as local or uncommon.

Ledum decumbens (Ait.) Lodd. ex Steud.

Windy River, on gravelly barrens, Nos. 2202, 2267, and 2460; Kazan River below Ennadai Lake, Nos. 2409 and 2414.

Abundant on rocky barrens where first flowers were noted on July 4, and fully developed capsules on September 1.

L. groenlandicum Oed.

Windy River, where it was noted as abundant in black spruce muskeg, Nos. 2216, and 2462; Josie's Bay, in upland spruce woods, No. 2311.

Rhododendron lapponicum Wahlenb.

Windy River, where it was not very common on rocky and gravelly ridges on barrens, Nos. 2226, 2243, and 2461. First flowers were noted on June 24.

Loiseleuria procumbens (L.) Desv.

Windy River, where it was noted as abundant on hilly, gravelly barrens, Nos. 2223, 2398, 2441, and 2526. First flowers noted on June 22 and mature capsules on August 20.

Kalmia polifolia Wang.

Windy River, where it was noted as very common in black spruce muskeg, Nos. 2211, 2246, 2271, and 2554.

Andromeda Polifolia L.

Windy River, Nos. 2229, 2273, 2384, and 2473; "Old Post" on Red River, No. 2547; Josie's Bay, No. 2296; Kazan River, below Ennadai Lake, No. 2410. Noted as common throughout the area, growing in sphagnum in open bogs or in spruce and tamarack muskegs. No. 2384 is infested with the rust *Calyptospora (Pucciniastrum) Goepfertiana* Kuhn.

**Chamaedaphne calyculata* (L.) Moench

Windy River, Nos. 2222 and 2239. Noted as common in wet, black spruce muskeg where first expanded flowers were noted on June 28.

Arctostaphylos alpina (L.) Spreng.

Windy River, Nos. 2214, 2235, 2425, and 2455. Noted as abundant on dry, rocky barrens where first expanded flowers were noted on June 16; mature fruits were collected on August 14, and on August 29 the leaves had turned.

**A. Uva-ursi* (L.) Spreng.

Two miles above mouth of Windy River, on rocky ledge, No. 2397; Red River, on rocky barrens, No. 2538.

Noted as rather uncommon, and apparently not maturing fruits in 1947.

Oxycoccus microcarpus Turcz.

Windy River, Nos. 2220 and 2347. Josie's Bay, No. 2299.

Noted as common on sphagnum tussocks in black spruce muskeg where the first fully expanded flowers were noted on July 22.

Vaccinium uliginosum L.

Josie's Bay, No. 2306; 2 miles above mouth of Windy River, No. 2433; mouth of Little River, No. 2444. Noted as abundant in black spruce muskegs where flowers were noted on July 14, and in a willow thicket by Little River, where mature fruits were found on August 25.

V. uliginosum var. *alpinum* Big.

Windy River, Nos. 2265 and 2456. Noted as abundant on rocky and gravelly ridges of the barrens where flowers were noted on July 4 and mature fruits on August 29.

V. Vitis-Idaea L. var. *minus* Lodd.

Windy River, Nos. 2206, 2280, 2386, and 2424; Josie's Bay, No. 2319.

Noted as abundant on gravelly and rocky ridges in the barrens. In No. 2206 last year's fruit still remained on the branches on June 10. Although the first flowers appeared as late as July 9, the "cranberry" apparently fruited abundantly in the Nueltin Lake area, in 1947.

In No. 2386 the leaves are attacked by the rust *Calypsotheca Goeppertiana* Kuhn.

Diapensia lapponica L.

Northwestern extremity of Nueltin Lake, South Bay, on hilly, gravelly barrens, where locally abundant and in full flower on July 2, No. 2253; Windy Bay, about 4 miles east of Windy River, No. 2326.

Menyanthes trifoliata L.

Windy River, locally common in a tundra pond near the boggy edge, flowering on July 26, No. 2356.

Pedicularis labradorica Wirsing.

Josie's Bay, common and flowering on July 12 in an open bog, No. 2305; Windy River, Nos. 2346 and 2518; "Old Post" on Red River, No. 2546. Noted as common in a spruce and tamarack muskeg as well as in open bogs.

Pinguicula villosa L.

Josie's Bay, where it was common locally on sphagnum tussocks in a spruce and tamarack muskeg and flowered on July 12, Nos. 2291 and 2298; Windy River, on sphagnum border of tundra pond, No. 2381.

**Galium labradoricum* Wieg.

Josie's Bay, in wet, boggy places near a stream, No. 2337; mouth of Windy River, in a sphagnum bog growing with *Stellaria calycantha*, fruiting specimens on September 2, No. 2468.

**Linnaea borealis* L. var. *americana* (Forbes) Rehder.

Windy River, among dwarf birches and "blueberry" bushes, flowering on July 28, No. 2365; Rocky Island in Windy Bay, mostly sterile specimens, No. 2486.

**Viburnum edule* (Michx.) Raf.

Windy River, 2-foot high bushes in sheltered nook among rocks, No. 2260; Josie's Bay, common locally on rocky, southern exposure, No. 2300; same locality, 4-foot bushes among spruces, No. 2331.

**Erigeron angulosus* Gaud. var. *kamtschaticus* (DC.) Hara.

E. acris, var. *asteroides* (Andrz.) DC.

Windy River, noted as uncommon among alder and willow, No. 2466.

**E. elatus* Greene.

E. acris, var. *arcuans* Fern.

Windy River, common locally in sphagnum part of burnt and cut-over spruce woods, No. 2390.

E. hyssopifolius Michx.

On rocks at Red River falls, 3 miles southwest of Simons Lake, No. 2540.

Antennaria? rosea (D.C. Eat.) Greene.

Windy River, common locally, but not noted elsewhere, on open river shore at base of bluff, with young flowering heads on July 23, No. 2349.

The large and well preserved, but rather immature, material is tentatively referred to *A. rosea*. As in that species, the inner phyllaries are pink, but the growth habit, the long, slender, and freely branching rhizomes and the solitary flowering stems, all suggest that No. 2349 may be an undescribed species. A similar and likewise immature collection of what is probably the same species was made on the north shore of McTavish Bay, Bear Lake, A. E. and R. T. Porsild, No. 5211 (Can.). Mature specimens are needed to determine its taxonomical position.

**Petasites frigidus* (L.) Fr.

Windy River, common in spruce and tamarack muskeg, No. 2499.

The present collection constitutes a considerable extension of the known range of this western species not heretofore recorded east of Coronation Gulf and Great Bear Lake (Porsild, 1943).

P. palmatus (Ait.) Gray.

Windy River, flowering specimens on June 29 in sphagnum in spruce muskegs, Nos. 2245 and 2387 (leaves only).

**P. sagittatus* (Banks) Gray.

Windy River, fairly common in wet sedge bog, No. 2392 (leaves only).

**Arnica alpina* (L.) Olin ssp. *attenuata* (Greene) Maguire.

Four-hill Creek, 2 miles above mouth of Windy River, in sparse spruce timber, No. 2393, flowering specimens were uncommon on August 8.

**A. lonchophylla* Greene ssp. *genuina* Maguire.

Windy River, uncommon on gravelly, rocky ridge when flowering specimens were collected on July 22, No. 2344.

A western race that, in the Hudson Bay region, was previously known from a single collection on the lower Churchill River (C. E. Cairnes, Can. 89677). The present collection extends its known range to southern Keewatin.

**Senecio? indecorus* Greene.

One mile above mouth of Windy River on damp ground in birch thicket, No. 2519.

The collection consists of a single, poorly developed and depauperate flowering specimen that was collected on September 25.

PRINCIPAL LITERATURE ON THE FLORA OF KEEWATIN

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Polunin, N. (1940): Botany of the Canadian Eastern Arctic: Pt. 1; Nat. Mus., Canada Bull, 92 : 1-408.

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BOTANICAL INVESTIGATIONS IN CENTRAL MANITOBA

By H. J. Scoggan

During the summer of 1948, the writer conducted a botanical survey of an area in central Manitoba extending from Cross Lake and Norway House north of Lake Winnipeg to Dawson Bay at the head of Lake Winnipegosis. Able assistance in the field was given by N. Neufeld of Winnipeg, G. L. Wilson of Teulon, Man., and R. L. Ozere of Ottawa. James S. Robinson of Norway House was employed as cook. His knowledge of the local terrain proved most helpful. Mr. Lawrence McKay of Grand Rapids acted as guide during the Dawson Bay survey.

The writer wishes to acknowledge very gratefully the assistance and hospitality of Mr. T. McEwan, manager of the Hudson's Bay Company post at Norway House, of Mr. A. M. Chalmers, manager of the Cross Lake post, and of Mrs. F. L. L. Campbell, private trader of Grand Rapids.

ITINERARY

The party travelled by steamer from Winnipeg, and arrived at Norway House on June 16. Some time was spent in the district making collections along Gunisao River and on the islands and mainland. The latter part of the month and the first week of July were employed in a survey of Nelson River "East Channel" between Norway House and Cross Lake. Several short portages around rapids were necessary in this section of the river. Considerable collecting was done in the Cross Lake region, and a trip westward of almost 60 miles with no portages was made on Minago River to the limestone country at the west end of Hill Lake, just off the Canadian Shield. The return to Norway House was made by way of Playgreen Lake, the "West Channel" of the Nelson drainage system in this district.

Work in the limestone area west of Lake Winnipeg was begun early in August. Collections representative of various habitats were made around Grand Rapids, after which the 3½-mile portage by horsedrawn "tramway" was made to Little Saskatchewan River above the rapids from which the settlement derives its name. The descent of these rapids is 71 feet in 5 miles, most of which is concentrated within two miles in the middle of the distance. From here to Cedar Lake, four portages were necessary. The season was one of unusually high water, following the spring floods in Western Canada, and progress was slow in this section. The 4¼-mile trip over East Mossy portage to Lake Winnipegosis was made on August 10. A week was spent in making collections at various localities in Dawson Bay, and, following the return to Grand Rapids on August 19, further work was done there until September 1, when the party embarked on the *SS. Keenora* for Winnipeg.

PREVIOUS WORK

A list of 31 plants collected around Cross Lake is given by John Macoun in an appendix to a report on the country between there and Hudson Bay by Dr. Robert Bell (1879-80).

John Macoun's Catalogue of Canadian Plants (Parts I-V, 1883-90) cites a number of species from Norway House and various localities in Dawson Bay.

C. W. Lowe's check-list of Manitoba plants (1943) reports many from "northern Manitoba", but without definite citation of locality. A number of reports are made for stations within the present survey area, although the great majority are for localities in the southern part of the province.

POPULATION AND INDUSTRIES

The area covered during the survey is still very largely in a wild state, and is thinly populated by scattered bands of Swampy Cree Indians to whom reservations of land have been allotted. The buildings of the sparse white population are clustered around trading posts and missions.

The Indians make their livelihood for the most part by hunting and engaging in seasonal fishing. The 1944 census of Indians in Canada (Indian Affairs Branch, Department of Mines and Resources, Canada) reports the population of bands in the area as follows: Norway House, 957; Cross Lake, 788; Grand Rapids, 118; Shoal River (Dawson Bay), 240.

Agriculture is carried on to a limited degree on the reservations and about trading posts, with the production of common garden vegetables for local use. A fine flower garden at the St. Joseph Indian Residential School at Cross Lake includes dahlias, marigolds, delphiniums, gladioli, nasturtiums, asters, bergamot, spiraea, and Iceland poppy. A small saw-mill operated by this mission supplies lumber for the settlement. Four-foot lengths of poplar and spruce are cut around Norway House for the wood-burning *SS. Keenora*, operated by the Selkirk Navigation Company between Winnipeg and Warrens Landing. The only other evidence of logging was in Dawson Bay, at the mouth of Red Deer River, where a fair-sized sawmill was in operation. This was the only part of the survey area in touch with the outside world by road.

CLIMATIC DATA

Tables I and II have been compiled from Volume I of "Climatic Summaries for Selected Meteorological Stations in the Dominion of Canada", issued by the Meteorological Division of the Department of Transport, Canada. The localities chosen are indicated by the following numbers: (1) Churchill; (2) Port Nelson; (3) The Pas; (4) Swan River; (5) Norway House; (6) Berens River; and (7) Winnipeg.

TABLE I
Monthly and Annual Averages of Daily Mean Temperature
(degrees Fahrenheit)

—	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Years observations...	30	11	27	11	40	19	66
January.....	-19	-17	-9	-6	-11	-8	-3
February.....	-17	-14	-2	-6	-4	-3	2
March.....	-6	-2	11	9	9	10	16
April.....	14	17	33	39	29	31	38
May.....	30	33	48	49	45	56	52
June.....	43	45	59	59	57	58	62
July.....	54	55	65	64	63	63	67
August.....	52	53	61	61	60	60	64
September.....	42	44	49	51	48	50	54
October.....	27	30	35	38	36	36	41
November.....	6	10	17	18	16	19	22
December.....	-11	-9	1	2	-2	0	6
Annual Average.....	18	21	31	31	29	30	35

TABLE II
Average Monthly and Annual Precipitation
 (in inches)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Years observations...	30	11	27	11	40	20	66
January.....	0.48	0.60	0.61	0.63	0.69	0.79	0.92
February.....	0.61	0.46	0.50	0.65	0.78	0.75	0.86
March.....	0.87	0.58	0.72	1.14	1.01	1.00	1.19
April.....	0.89	0.88	0.81	0.79	0.74	0.92	1.37
May.....	0.93	0.85	1.38	1.52	1.08	1.41	2.26
June.....	1.85	2.07	2.20	3.41	1.93	2.49	3.15
July.....	2.19	1.64	2.22	2.80	2.29	2.25	3.08
August.....	2.69	2.08	2.11	2.27	2.38	1.99	2.45
September.....	2.33	1.79	1.96	1.78	1.85	2.94	2.35
October.....	1.43	0.96	1.16	0.82	0.93	1.62	1.49
November.....	1.03	1.04	0.98	1.13	1.07	1.31	1.12
December.....	0.66	0.81	0.79	0.98	0.83	1.02	0.95
Annual Average.....	15.96	13.76	15.44	17.92	15.58	18.49	21.19

GENERAL CHARACTER OF THE DISTRICT

The eastern Norway House-Cross Lake area lies within the southwestern edge of the Canadian Shield, which continues southward to form the east coast of Lake Winnipeg. Extensive exposures of pre-granitic rocks occur in the Cross-Pipestone area, whose geology has been described by Alcock (1919).

The western area from Grand Rapids to Dawson Bay lies within the broad belt of Ordovician limestones and dolomites that bound Lake Winnipeg on the west. The physical features of this area have been described by J. B. Tyrrell (1889-91).

The entire survey area lies within the basin of glacial Lake Agassiz, of which the present-day shallow Lakes Winnipeg, Winnipegosis, Manitoba, and Lake of the Woods are the remnants. This lake was formed following the withdrawal of the Pleistocene ice-sheet to the north over the northwardly sloping land surface. During its first stage, discharge was southward into the Mississippi, by way of Minnesota River. Following deglaciation of the southwest slope of Hudson Bay, the present northeastward drainage system was established.

Four well-defined ridges of rounded gravel, representing the lowest series of Lake Agassiz beaches in the region, occur along the "tramway" portage at Grand Rapids (Tyrrell, 1891; Johnston, 1946). The moraine crossed by East Mossy portage between Cedar Lake and Lake Winnipegosis probably represents the position of the ice-border at the Campbell stage. Little is known concerning former beaches of the isolated and forested northeastern section of the basin. The apparent absence of beaches may be due to the fact that the lake was dammed in the north by the vertical face of the ice-wall itself.

On the whole, the area surveyed is a broad expanse with few elevations over 150 feet above lakes and muskegs. Original irregularities in the surface were levelled by deposition of lacustrine clays and sands, and a

youthful drainage pattern was established. The tendency of the rivers to give off "stray" channels is especially noticeable in the case of the Nelson, which, in the first 100 miles of its flow from Playgreen Lake, spreads itself over a considerable breadth of country in straggling channels of various sizes. Such local names as "High Rock" and "Steep Rock", with elevations of about 50 and 80 feet respectively above the water, emphasize the general level nature of the country.

MAJOR PLANT COMMUNITIES

The eastern and western areas fall respectively into the Nelson River and Manitoba Lowlands sections of Halliday's forest classification for Canada (1937). Black and white spruce (*Picea mariana* and *P. glauca*) are the characteristic trees of well-drained sites, with balsam fir (*Abies balsamea*), paper birch (*Betula papyrifera* and its var. *neoalaskana*), and American aspen (*Populus tremuloides*) as common associates. Black spruce and tamarack (*Larix laricina*) grow in bogs and muskegs, and balsam poplar (*Populus balsamifera*) is found along low shores, usually associated with black spruce, but often in pure stands. Various species of willows (*Salix*) and alders (*Alnus*) form extensive shoreline communities.

Jack pine (*Pinus Banksiana*) grows on dry rock surfaces, and is the dominant tree of gravel ridges, as at Grand Rapids. American elm (*Ulmus americana*) and Manitoba maple (*Acer Negundo*) are common in the Dawson Bay region of northern Lake Winnipegosis, but absent in the east except for planted individuals of the latter. Cedar Lake, in the limestone area west of Grand Rapids, takes its name from a remarkable outlier of white cedar (*Thuja occidentalis*) at a distance of almost 200 miles from southeastern Manitoba, the western limit of its main area. Red ash (*Fraxinus pensylvanica*) was seen on an alluvial island in Little Saskatchewan River near Cedar Lake, and is reported on Red Deer River at the head of Lake Winnipegosis. Richardson's report of basswood (*Tilia glabra*) at Norway House, far north of the main area of its western limit, may refer to planted trees. None was seen by the writer.

Common forest associates include Virginia grape-fern (*Botrychium virginianum*), spiny shield-fern (*Dryopteris spinulosa*), clubmosses (*Lycopodium complanatum*, *L. clavatum*, *L. annotinum*, *L. obscurum* var. *den-droideum*), horsetails (*Equisetum pratense*, *E. scirpoides*, *E. sylvaticum* var. *pauciramosum*), sedges (*Carex disperma*, *C. tenuiflora*, *C. Deweyana*), small round-leaved orchis (*Orchis rotundifolia*), small northern bog orchis (*Habenaria obtusata*), rattlesnake plantain (*Goodyera repens* and its var. *ophioides*), bracted green orchis (*H. viridis* var. *bracteata*), northern green orchis (*H. hyperborea*), coral-roots (*Corallorhiza maculata*, *C. trifida*), lady's slippers (*Cypripedium passerinum*, *C. Calceolus* var. *parviflorum*), ladies' tresses (*Spiranthes Romanzoffiana*), wild lily-of-the-valley (the western vicariad, *Maianthemum canadense* var. *interius*), showy sandwort (*Arenaria lateriflora*), northern stitchwort (*Stellaria calycantha*), long-leaved stitchwort (*S. longifolia*), anemones (*Anemone virginiana*, *A. cylindrica*, *A. canadensis*), gold-thread (*Coptis trifolia* subsp. *groenlandica*), naked-stalked mitrewort (*Mitella nuda*), dwarf raspberry (*Rubus pubescens*), stemless raspberry (*R. acaulis*), creamy sweet pea (*Lathyrus ochroleucus*), Canadian milk vetch (*Astragalus canadensis*), Seneca snake-root (*Polygala Senega*), bunchberry

(*Cornus canadensis*), smooth sarsaparilla (*Aralia nudicaulis*), black snake-root (*Sanicula marilandica*), starflower (*Trientalis borealis*), Indian pipe (*Monotropa uniflora*), one-flowered pyrola (*Moneses uniflora*), false wintergreen (*Pyrola virens*), liverleaf wintergreen (*P. asarifolia* and its var. *purpurea*), one-sided wintergreen (*P. secunda*), cow-wheat (*Melampyrum lineare*), tall lungwort (*Mertensia paniculata*), sweet-scented bedstraw (*Galium triflorum*), twinflower (*Linnaea borealis* var. *americana*), snowberry (*Symphoricarpos albus*), twining honeysuckle (*Lonicera glaucescens*), and cranberry-bush (*Viburnum edule*).

The general aquatic vegetation consists of various species of pondweed (*Potamogeton*), and bur-reed (*Sparganium*), bladderworts (*Utricularia vulgaris* and *U. intermedia*), yellow water lily (*Nuphar variegatum*), water smartweed (*Polygonum amphibium* var. *stipulaceum* f. *fluitans*), water crow-foot (*Ranunculus aquatilis* var. *capillaceus*), water milfoil (*Myriophyllum exalbescens*), and mare's-tail (*Hippuris vulgaris*). Lesser duckweed (*Lemna minor*) is of common occurrence floating on still waters of ponds and inlets, and ivy-leaved duckweed (*Lemna trisulca*) is frequent. Less common elements of the deep water vegetation include hornwort (*Ceratophyllum demersum*), white water lilies (*Nymphaea odorata* var. *minor*, and the widespread but extremely localized *N. tetragona* subsp. *Leibergi*), small bladderwort (*Utricularia minor*), water starwort (*Callitriche palustris*), and Canadian pondweed (*Anacharis canadensis*).

In more shallow water, often against a willow-alder background, occur belts that include as their chief elements swamp horsetail (*Equisetum fluviatile* f. *linnaeanum*), common bulrush (*Scripus validus* var. *creber*), and sedges (chiefly *Carex aquatilis* and *C. rostrata* var. *utriculata*). Extensive colonies of spangle top grass (*Fluminia festucacea*) and tall reed grass (*Phragmites communis* var. *Berlandieri*) occur scattered throughout this zone. In still shallower water and mud are found arrow-heads (*Sagittaria latifolia* and *S. cuneata*), spike-rush (*Eleocharis* spp.), cat-tail (*Typha latifolia*), creeping spearwort (*Ranunculus Flammula* var. *ovalis*), mudwort (*Limosella aquatica*), tufted loosestrife (*Lysimachia thyrsiflora*), and water parsnip (*Sium cicutaefolium*). Sweet-flag (*Acorus Calamus*), known locally as wild ginger, is of frequent occurrence in this zone or in somewhat deeper water.

Where the slope of the terrain is not great, transition from shore to upland habitat may take place through a belt of sphagnum muskeg. Such a zone opposite High Rock on Nelson River has as its dominant trees black spruce and tamarack, with scattered willows (*Salix candida*, *S. planifolia*, *S. pedicellaris* var. *hypoglauca*) and birches (*Betula papyrifera* var. *neoalaskana* and *B. glandulosa*), and a ground cover consisting of the sedges and ericaceous plants normally found in wet acidic habitats, together with the usual cotton-grass (*Eriophorum spissum*), baked-apple-berry (*Rubus Chamaemorus*), marsh cinquefoil (*Potentilla palustris*), sundew (*Drosera rotundifolia*), and pitcher-plant (*Sarracenia purpurea*).

Approaching a gravel ridge about $\frac{1}{2}$ mile from the river, the above muskeg gives place to an open, in places park-like, aspen—jack pine—white spruce forest, including in its ground cover red prairie lily (*Lilium philadelphicum*), wild lily-of-the-valley (*Maianthemum canadense* var. *interius*), rattlesnake plaintain (*Goodyera repens* var. *ophioides*), northern bastard

toad-flax (*Geocaulon lividum*), Richardson's toad-flax (*Comandra Richardsoniana*), prairie anemone (floral emblem of Manitoba, *Pulsatilla ludoviciana*), red windflower (*Anemone multifida* var. *hudsoniana* f. *sanguinea*), strawberry (*Fragaria virginiana*), dwarf raspberry (*Rubus pubescens*), northern prickly rose (*Rosa acicularis*), hooked violet (*Viola adunca*), fireweed (*Epilobium angustifolium*), wild sarsaparilla (*Aralia nudicaulis*), bunchberry (*Cornus canadensis*), wintergreens (*Pyrola virens*, *P. asarifolia*, and *P. secunda*), Labrador tea (*Ledum groenlandicum*), Canada blueberry (*Vaccinium canadense*), rock cranberry (*V. Vitis-Idaea* var. *minus*), northern bedstraw (*Galium boreale*), twining honeysuckle (*Lonicera glaucescens*), snowberry (*Symphoricarpos albus*), twinflower (*Linnaea borealis* var. *americana*), cranberry-bush (*Viburnum edule*), and hairy goldenrod (*Solidago hispida*).

PLATE XIV



Precambrian exposure at McCall Rapids on Nelson River 8 miles south of Pipestone Lake.

The granite rocks of the eastern area (See Plate XIV) support a xerophytic flora whose characteristic elements include three-toothed saxifrage (the arctic American *Saxifraga tricuspidata*), heucheras (the western American *Heuchera hispida* and *H. Richardsonii*) glaucous spear grass (the arctic circumpolar *Poa glauca*), mountain fescue (the boreal American *Festuca saximontana*), wood whitlow-grass (*Draba nemorosa* of western North America and Eurasia), American rock brake (the western American-eastern Asiatic *Crytogramma acrostichoides*), pink corydalis (the boreal American *Corydalis sempervirens*) rusty woodsia (the arctic circumpolar *Woodsia ilvensis*), rock spikemoss (the temperate eastern American *Selaginella rupestris*), cinquefoils (*Potentilla* spp.), northern bedstraw (the boreal American *Galium boreale*), harebell (the arctic circumpolar *Campanula rotundifolia*), and rock cranberry (the arctic circumpolar *Vaccinium Vitis-Idaea* var. *minus*). Junipers (the boreal American *Juniperus communis*

var. *depressa* and *J. horizontalis*) and bearberry (the boreal circumpolar (*Arctostaphylos Uva-ursi*) are common evergreen trailing shrubs of this habitat. Sweet grass (*Hierochloe odorata*), reed canary grass (*Phalaris arundinacea*), reed bent grass (*Calamagrostis canadensis*), slough grass (*Beckmannia Syzigachne*), and short-awn foxtail (*Alopecurus aequalis*) occupy wet crevices and depressions in the rock surface, common associates being beaked sedge (*Carex rostrata* var. *utriculata*), retrorse sedge (*C. retrorsa*), baltic rush (*Juncus balticus*), slender rush (*J. macer*), white camas (*Zygadenus chloranthus*), pale persicaria (*Polygonum lapathifolium*), golden dock (*Rumex fueginus*), narrow-leaved dock (*R. triangulivalvis*), small-flowered crowfoot (*Ranunculus abortivus*), bristly crowfoot (*R. pensylvanicus*), winter cress (*Barbarea vulgaris* var. *arcuata*), bitter cress (*Cardamine pensylvanica*), marsh cress (*Rorippa islandica* var. *hispida*), silverweed

PLATE XV



Pasture sage (*Artemisia frigida*), at crest of limestone cliffs of an island in Dawson Bay, Lake Winnipegosis.

(*Potentilla Anserina*), meadow-sweet (*Spiraea alba*), water hemlock (*Cicuta maculata*), dwarf Canadian primrose (*Primula mistassinica*), water horehounds (*Lycopus americanus* and *L. uniflorus*), Canada mint (*Mentha canadensis* var. *glabrata*), woundwort (*Stachys palustris* var. *pilosa*), and hairy speedwell (*Veronica peregrina* var. *xalapensis*). The transition zone from open rock habitat to mesophytic forest is characterized by such shrubs as buffalo berry (*Shepherdia canadensis*), alders (*Alnus crispa* and *A. rugosa* var. *americana*), shadbushes (*Amelanchier alnifolia* and *A. sanguinea*), red osier dogwood (*Cornus stolonifera* and its var. *interior*), buckthorn (*Rhamnus alnifolia*), and an occasional stand of silverberry (*Elaeagnus commutata*) and beaked hazelnut (*Corylus cornuta*). Mountain-ash (*Pyrus decora* and *P. americana*), choke cherry (*Prunus virginiana*), and pin cherry (*P. pensylvanica*) are common small trees of this zone.

The calcareous rocks of the western area (See Plate XV) harbour certain species not found on the eastern granites. Characteristic plants include shrubby cinquefoil (*Potentilla fruticosa*), false asphodel (*Tofieldia glutinosa*), hair-like sedge (*Carex capillaris* var. *elongata*), milk vetch (*Astragalus frigidus* var. *americanus*), hedsarum (*Hedysarum alpinum* var. *philoscia*), and fleabanes (*Erigeron lonchophyllus*, *E. hyssopifolius*, and *E. glabellus* subsp. *pubescens*). Black twinberry (*Lonicera involucrata*) was found on limestone ledges of the Minago River entrant into Hill Lake, about a quarter of a mile west of the Canadian Shield contact. The prairie influence is demonstrated by the presence of hoary puccoon (*Lithospermum canescens*), mint-leaved bergamot (*Monarda menthaefolia*), and a group of composites including blazing star (*Liatris ligulistylis*), gaillardia (*Gaillardia aristata*), prairie ragwort (*Senecio plattensis*), cut-leaved groundsel (*S. eremophilous*),

PLATE XVI



Salt spring near Salt Point in Dawson Bay, Lake Winnipegosis, with carpet of samphire (*Salicornia europaea*), salt-marsh sand spurry (*Spergularia marina*), seaside crowfoot (*Ranunculus Cymbalaria*), and other halophytic species.

silvery groundsel (*S. canus*), pasture sage (*Artemisia frigida*), smooth-leaved wormwood (*A. glauca*), prairie sage (*A. ludoviciana* var. *gnaphalodes*), smooth false dandelion (*Agoseris glauca*), small-leaved everlasting (*Antennaria microphylla*), prairie everlasting (*A. campestris*), Maximilian's sunflower (*Helianthus Maximiliani*), low goldenrod (*Solidago missouriensis*), and showy goldenrod (*S. pulcherrima*).

Saline areas around salt springs in Dawson Bay (See Plate XVI) have a halophytic flora including seaside arrow-grass (*Triglochin maritimum*), desert salt grass (*Distichis stricta*), alkali cord grass (*Spartina gracilis*), Nuttall's alkali grass (*Puccinellia Nuttaliana*), orach (*Atriplex hastata*), samphire (*Salicornia europaea*), western sea blite (*Suaeda depressa*), salt-marsh sand spurry (*Spergularia marina*), seaside crowfoot (*Ranunculus*

Cymbalaria), sea milkwort (*Glaux maritima*), seaside plantain (*Plantago juncooides* var. *decipiens*), and few-flowered aster (*Aster pauciflorus*). The essentially littoral smooth beach pea (*Lathyrus japonicus* var. *glaber*) grows in abundance on sandy and gravelly beaches of islands in Playgreen Lake, and on sandy beaches and fields at Warrens Landing. It was also found in the limestone area on a gravel point near Grand Rapids.

The introduced flora includes many common weeds of the mustard and legume families, as well as foxtail grass (*Hordeum jubatum*), slender stinging nettle (*Urtica gracilis*), lamb's-quarters (*Chenopodium album*), Russian pigweed (*Axyris amaranthoides*), caraway (*Carum Carvi*), horseweed (*Conyza canadensis*), Canadian thistle (*Cirsium arvense*), dandelion (*Taraxacum officinale*), field sow-thistle (*Sonchus arvensis* var. *glabrescens*), great burdock (*Arctium Lappa*), green amaranth (*Amaranthus retroflexus*), and ragweeds (*Ambrosia artemisiifolia* and *A. trifida*). Sweet William (*Dianthus barbatus*) is abundant near old stables on the Lake Winnipegosis side of East Mossy portage. Its seeds were probably brought in with hay for the horses formerly used on this portage.

CONCLUSION

Approximately 7,000 sheets of plant specimens were obtained, representing 2,643 collections of 540 species and numerous varieties at different localities. More than 40 per cent of these show considerably increased northward extensions over previously published reports, in most cases of the order of 150-200 miles. Twenty-five of the entities appear to be new to the flora of Manitoba. Over 28 per cent of the species were previously unrepresented in the Manitoba collections of the National Herbarium.

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ZOOLOGICAL INVESTIGATIONS IN WESTERN SASKATCHEWAN

By W. E. Godfrey

Field investigations of the bird and mammal faunas of western Saskatchewan were conducted during the summer by the writer, assisted by S. D. MacDonald, Rodger O. Standfield, and until July 29, by B. C. W. Hummel. The purpose of this survey was to ascertain particularly the distribution and numerical status of the birds and mammals, and to collect adequate series of specimens of these faunas for the reference collections of the National Museum. The period June 4 to July 14 was spent in southwestern Saskatchewan where work was centred in the Cypress Hills. This 100-mile long, rather flat-topped plateau trends east-west, its west end extending well into Alberta. In Saskatchewan it rises as high as 4,500 feet above sea-level. Although emphasis was placed on studying the Cypress Hills plateau faunas, considerable work was done also on the plains south to the Montana border and north to Crane and Bigstick Lakes.

The altitudinal variations in southwestern Saskatchewan account for the complex variety of ecological community relationships found there and a consequently complex distribution of the bird and mammal influents of these communities. Three life zones are recognizable in the region, Canadian, Transition, and dilute Upper Sonoran. Although the distribution of the faunas investigated is too intricate for summary treatment, certain aspects of distribution are particularly noteworthy.

Terrestrial bird distribution in any region is largely determined by the types and distribution of plant cover, which in turn are governed largely by climate and edaphic factors. In the region studied coniferous forest (lodgepole pine and white spruce) is of considerable extent and normally of good stature on the higher parts of Cypress Hills plateau. Below the conifers a broad zone of aspen extends down to middle altitudes where it gives way to grassland. However, tongues of timber, aspen, balsam poplar, cottonwood, and box elder associated with tall shrub tangles follow the streams and their flood-plains, down to and often on to the prairie. Of especial interest to the zoologist is the cool coniferous forest of the high plateau, which is surrounded by semi-arid plains and, therefore, isolated from similar habitat in the Rocky Mountains.

The highest parts of the plateau appear to be unglaciated, but that the resulting refugium was small is indicated by evidence of glaciation (moraines and kettle-holes) in the broad but not deep valley that crosses the plateau at the west end of the centre block of hills. The affinities of the avifauna now breeding in the unglaciated high parts of the plateau are decidedly with those occurring in the Rocky Mountains to the west and to the southwest in Rocky Mountain outliers in Montana, rather than with the avifauna occupying the coniferous forests of central and northern Saskatchewan.

In the period July 21 to September 6 the birds and mammals of the Flotten Lake-Meadow Lake area, central western Saskatchewan, were investigated. Topographically this area is characterized by low, rounded hills. In its forest cover mixedwood associations are common, and aspen and balsam poplar cover extensive burned areas. Jack pine covers large

areas where the soil is sandy, and white spruce reaches excellent individual development, particularly near lakes. Numerous lakes, streams, marshes, bogs, and meadows are well distributed among the low hills, and these, in addition to man-made clearings in the southern part of the area, furnish in their respective vegetation covers a variety of habitats for the numerous and varied bird and mammal populations the expedition found there.

Although the bird fauna of the region as a whole is somewhat less diverse than is that of the Cypress Hills region, the avifauna of the coniferous forest is an important exception, being more numerous and varied than that of the Cypress Hills.

The expedition made detailed notes on the distribution, numerical status, habitat preferences, and habits of the birds and mammals of both the Cypress Hills and Flotten Lake regions, obtaining information on over 260 species. This information is supplemented by habitat photographs and a small collection of plants for ecological studies. A total of 1,078 specimens of birds, mammals, reptiles, and amphibians were collected and preserved for the reference collections of the National Museum. A comprehensive report on the ornithological results of this survey, supplemented by laboratory taxonomic study of the bird specimens collected, is in the course of preparation.

MAMMALS OF THE LAKE ST JOHN REGION, QUEBEC

By Austin W. Cameron and Phillip A. Orkin

INTRODUCTION

The mammalogical results of a National Museum of Canada field party working in the Lake St. John region, Quebec, during the summer of 1946 are the subject of the present paper. A. L. Wilk was in charge of the party and the junior author served as assistant. Two local trappers, Napoleon Lalocette and Felix Garneau, acted as guides. A 3-month period, from June 7 to September 9 was spent in the region. One hundred and thirty-eight specimens representing 27 species were collected. A taxonomic study of the collection was made by the senior author during the winter of 1948-49.

CLIMATE AND PHYSIOGRAPHY

Lake St. John, situated approximately 120 miles north of Quebec city, is an elliptical body of water some 350 square miles in area. Several rivers flow into it from the north and west, the largest of which are the Mistassini, Peribonka, and Ashuapmuchuan. It is drained from the east by the Saguenay, which flows into the St. Lawrence.

During Pleistocene times much of what is now the Lake St. John region was covered by an arm of the sea that filled a depression in the Laurentian Shield. With the subsequent uplifting of the land the water receded exposing a broad, relatively level plain several hundred feet below the surrounding Laurentian escarpment. Lake St. John occupies what was formerly the lowest depression in the floor of the Pleistocene fiord (Dresser, 1916).

The soil of the plain consists of fertile sands and clays deposited by the inland sea. Its fertility is attested by the success that has been achieved by the farming done there in recent years. Formerly it was covered by a heavy stand of conifers, but this was largely destroyed by the "Great Fire" of 1870. Today most of the land is given over to agriculture. Although the original forest is gone there are scattered stands of jack pine on the sandy ridges and mixed woods along the granite outcroppings and in waste places between the fields. Recurrent fires have resulted in a sub-climax association of scrubby pine and poplar, birch, and cherry, with a ground cover of Labrador tea, laurel, reindeer moss, and blueberry. Halliday (1937) refers the woodland of the plain to the Great Lakes-St. Lawrence Forest Region.

The highlands surrounding the plain mark the edge of the Laurentian Shield, which extends north and west to James and Hudson Bays. The terrain is exceedingly rugged and there are numerous outcrops of Precambrian rocks. The soil is of glacial origin and supports a heavy stand of conifers, which is typical of the "Northern Forest Belt" (Glendinning, 1935).

Lake St. John is a shallow body of water in the centre of the plain. It is bounded on the north and west by sphagnum bogs, and on the south and

east by sand bars. Recent hydro-electric developments in the area have raised the level of the lake 27 feet, flooding much of the surrounding land and drowning out many of the trees along its shores.

The climate of the Lake St. John region is one of long, cold winters and short, warm summers. Temperatures over a 10-year period ranged from a minimum of -46° to a maximum of 97° . Mean temperatures for January and July, respectively, 0° F. and 66° . The prevailing winds are westerly, being southwesterly in summer and often southeasterly in spring and autumn. Precipitation varies from 1.4 inches in March to 3.6 inches in July.

THE MAMMAL FAUNA

The drastic ecological changes that have taken place since the advent of the white man have had a profound effect upon the mammal life of the region. The removal of the forest on the plain has deprived many species of suitable habitat, so that such forest-dwelling mammals as the moose, marten, black bear, and wolf are now rare, although formerly quite abundant. The raising of the water level of the lake, in addition to excessive trapping, is said to be responsible for the scarcity of beaver in the area. On the other hand, certain species that favour fields and meadows, for example, moles, meadow mice, and woodchucks, have benefited because of the transformation.

Heretofore practically nothing has been written on the mammals of the region. In 1895, Outram Bangs visited Lake St. John but he found it, ". . . . a dreary valley, that seems wholly destitute of mammalian life. The forest has been cleared away and the barren fields and desolate shrub are wholly unfit to supply the needs of even the smaller mammals" (Bangs, 1896). He retraced his steps and collected instead at Lac Edouard, 65 miles to the south.

Of the mammals taken by Bangs at Lac Edouard, or known by him to exist there, two (the wolverine and the caribou) have disappeared from the Lake St. John area, and a third (the beaver) is almost extinct except in Laurentides Park. Three others, the pigmy shrew (*Microsorex hoyi*), the long-eared bat (*Myotis keenii septentrionalis*), and the lemming mouse (*Synaptomys cooperi*) have not been recorded from Lake St. John. Seven mammals not mentioned by Bangs were found in 1946: the smoky shrew (*Sorex fumeus*), the little brown bat (*Myotis lucifugus*), the fisher (*Martes pennanti*), the lynx (*Lynx canadensis*), the groundhog (*Marmota monax*), the porcupine (*Erethizon dorsatum*), and the meadow jumping mouse (*Zapus hudsonius*).

ITINERARY IN 1946

The 1946 field party made observations on, and collected specimens of, mammals at the following stations:

Camp 1, June 7 to July 4, was located about 4 miles below St. Félicien on the west bank of Ashuapmuchuan River. This was in typical farming country with broad grassy fields and damp meadows. This type of habitat was favourable for *Microtus*, *Zapus*, and *Marmota*. Traps set in the coppices of poplar, spruce, and jack pine, which bordered the fields yielded *Sorex cinereus* and *Clethrionomys*.

Camp 2, July 4 to 12, was located on the east bank of Salmon River, 6 miles south of Notre Dame de la Doré. The terrain in this area was

quite rugged and covered with a subclimax association of young trees and shrubs. To the east of the river were numerous sand ridges that supported a heavy growth of jack pine. The sparse understory and absence of leaf-litter accounted for the scarcity of small mammals in the area. *Peromyscus*, *Tamias*, and *Zapus*, however, were taken where there were vigorous stands of subclimax vegetation.

Camp 3, July 13 to 26, was on the west bank of Mistassini River, 8 miles east of St. Méthode. Most of the area in the immediate environs of the camp consisted of marsh and low-lying shrubby woodland, interspersed with a few mature conifers. Fewer mammals were collected there than elsewhere in the Lake St. John region, primarily because few species, except *Ondatra*, favour such wet situations.

Camp 4, July 27 to September 9, was situated at Val Jalbert, one-quarter of a mile below the Ouatichuan Falls. The more precipitous slopes of the Ouatichuan Valley supported a heavy stand of white spruce, and the gentler slopes consisted of mixed woods and shrubbery. Sizable stands of spruce, birch, and poplar grew along the river bank. Such a diversity of habitats is reflected in the variety of mammals collected in the area: *Condylura*, *Sorex cinereus*, *Sorex fumeus*, *Blarina*, *Tamiasciurus*, *Microtus*, and *Zapus*.

The expedition also collected, and made observations on, the birds of the region. The results of this phase of the investigation have been published by W. Earl Godfrey and A. L. Wilk (1948). One hundred and thirty-three birds were recorded in the region by the expedition, and 564 specimens representing 103 species were collected.

SYSTEMATIC LIST

Of the thirty-five species treated in the following list, twenty-eight are represented by specimens in the National Museum of Canada collection. The number of specimens of each race used for comparison purposes is given in parentheses. The systematic order employed is that used in Anderson's "Catalogue of Canadian Recent Mammals".

The senior author is indebted to Dr. R. M. Anderson, Honorary Curator in Mammalogy, and W. E. Godfrey, Ornithologist, both of the National Museum of Canada, for assistance in connection with the taxonomic work involved in the present study.

***Condylura cristata cristata* (Linnaeus).** STAR-NOSED MOLE

Mole workings were common in black earth in hayfields along the southwestern part of the lake, but several were noted in brown sandy loam. Two were received from local farmers who reported that they are frequently found under haycocks. Another was trapped in the open near the edge of a cat-tail swamp.

Specimens were taken as follows: Val Jalbert, 2; St. Méthode, 1.

Two males measured (in mm.), total length, 172, 191; tail, 73, 77; hind foot, 29, 28; weight, 41.1, 50.1 gm.

One female measured (in mm.), total length, 182; tail, 75; hind foot, 27; weight, 41.9 gm.

Sorex cinereus cinereus Kerr. COMMON CINEREOUS SHREW

Taken in grassy fields and under leaf mould in deciduous and coniferous forest.

A nursing female was taken on July 14.

Specimens were taken as follows: St. Félicien, 4; St. Méthode, 4; Val Jalbert, 2; northwest of Laurentides Park, 3.

Nine males measured (in mm.), total length, 92 (86–100); tail, 40 (38–43); hind foot, 12 (11.5–12.5); weight, 4.1 gm. (3.2–4.7 gm.).

Four females measured (in mm.), total length, 90 (83–100); tail, 40 (37–42); hind foot, 12 (11.5–12.5); weight, 4.2 gm. (3.1–6.7 gm.).

Average take for 10,000 trap nights, 0.45 per 100 trap nights. Best take in 100 trap nights, 3.

The above specimens were compared with twenty specimens of *S. c. cinereus* from Ontario, and twelve of *S. c. acadicus* from Nova Scotia and New Brunswick. The Lake St. John specimens agree with those from Ontario in being generally smaller than specimens from Nova Scotia and New Brunswick. They agree, also, with the former in the following skull characters: maxillary tooth row strongly arched, braincase averaging smaller, rostrum averaging shorter.

Sorex fumeus fumeus Miller. SMOKY SHREW

Three males were taken in one day in a wet hardwood glen. Apparently very local in distribution.

Sorex cinereus also was taken at this spot.

Three male specimens taken at Val Jalbert measured (in mm.), total length, 112, 104, 115; tail, 49, 50, 49; hind foot, 14, 13.5, 14; weights, 6.7, 5.8, 6.3 gm.

The above are more brownish than specimens in comparable pelage from Nova Scotia (7), agreeing in this respect with a series of *S. f. fumeus* from southern Ontario.

Sorex palustris albibarbis (Cope). WHITE-LIPPED WATER SHREW

One male was trapped along a pasture fence-row several hundred yards from the nearest water.

One male specimen taken at St. Félicien, measured (in mm.), total length, 131; tail, 68; hind foot, 19; weight, 10.4 gm.

The underparts of this specimen are scarcely lighter than the upper parts and the tail is not bicolour (except near the base), agreeing in these respects with *albibarbis* from southern Quebec.

Blarina brevicauda talpoides (Gapper). GAPPER'S SHORT-TAILED SHREW

Locally common in deciduous woods and in mole tunnels in grassland. Pregnant females were taken June 19 and July 29.

Specimens were taken as follows: Val Jalbert, 7; St. Méthode, 1; St. Félicien, 3.

Three male specimens measured (in mm.), total length, 124 (118–129); tail, 28 (27–30); hind foot, 16.3 (16–16.5); weight, 19.7 gm. (18.5–21 gm.).

Eight females measured (in mm.), total length, 118 (104–129); tail 26 (24–28); hind foot, 16 (15–16.5); weight, 20 gm. (13.1–28.6 gm.).

Average take for 10,000 trap nights was 0.48 per 100 trap nights. Best take in 100 trap nights, 3.

The above specimens agree with a series from southern Ontario (27), in being darker and browner dorsally than specimens of *B. b. angusta* (9) from Gaspé, and *B. b. pallida* (12) from Nova Scotia.

Myotis lucifugus lucifugus (LeConte). LITTLE BROWN BAT

One was taken at Val Jalbert on September 5. Small bats, perhaps this species, were often seen in the evening in this area, and at Roberval.

A limestone cave about one-half mile south of Val Jalbert station was examined. The local people say bats are found there, but there was no sign of them in the more accessible parts of the cave on August 15.

The cave is about 5 feet wide and 12 feet high at the entrance, but after 40 feet or so, it becomes very low and narrow. The far end cannot be seen, but there is running water on the floor, so the cave may extend for some distance. Possibly bats may roost or even hibernate in the narrower, deeper part.

Euarctos americanus americanus Pallas. AMERICAN BLACK BEAR

Tracks of this animal were seen along the banks of Rivière au Saumon. They appear to be very retiring in the vicinity of the lake. Local farmers said that they live on the high ground, often coming down at night to kill sheep. One bear, shot by a farmer near Val Jalbert on August 5, was said to have killed over a dozen sheep. The skull of this specimen was obtained. A young male was collected on the high ground about 20 miles southwest of St. Jerome.

In mid-July a trip was made up the new Chibougamau road to a point about 40 miles north of the lake. Here many signs of bear were seen and local trappers reported that bears are very destructive to camps in the area, often breaking into food stores. About twenty-five were killed by local trappers along the road during May and June 1946.

Thalarctos sp. POLAR BEAR

A polar bear was shot at Ste. Jeanne d'Arc near Peribonca in October 1938 (Jackson, H. H. T., 1939). Polar bears are frequently carried south by the ice into the Gulf of St. Lawrence. Usually they follow the coast back to the north after landing, and it is exceptional for one to straggle inland (Doutt, 1940).

Vulpes fulva subsp. RED FOX

Fur dealers in this district say this is second in importance only to the muskrat among the fur-bearers in the immediate vicinity of the lake. Red, black, and cross phases are found. They are trapped in the extensive woodlots and pastures that form the main part of the agricultural area.

A juvenile cross fox was trapped near a farmyard at the mouth of the Mistassini in July.

Alopex lagopus subsp. ARCTIC FOX

Occasionally the Arctic fox is reported to come south in winter as far as the North Shore of the Gulf of St. Lawrence, and even to Cape Breton Island (De Vany, 1923). From the North Shore they have been known to

penetrate inland as far as Lake St. John. Mr. Clement Dufour, fur dealer of Chicoutimi, said there was a wave of them about 1917; he bought forty skins taken in the Lake St. John area that year. Since then he has seen about two. Mr. D. E. Cooter who has been at the Hudson Bay post at Pointe Bleue for over 20 years says he bought an Arctic fox skin, taken near Peribonca in the winter of 1944-45, the first he had ever seen.

Canis lupus subsp. **TIMBER WOLF**

According to the local farmers, wolves are almost unheard of along the southern part of the lake; reports of wolves are received from the northwest every winter. Mr. Cooter stated that he buys a few dozen skins every year, no more, mostly taken far to the north of the lake. They command a good price and he was certain trappers make every effort to get them.

Martes americana subsp. **MARTEN**

Mr. Cooter said they are locally rare; most of the skins traded come from far north of Peribonca. A guide, Felix Garneau, said that he takes a few every winter in the area northwest of Laurentides Park.

Martes pennanti pennanti (Erxleben). **FISHER**

Surprisingly, this animal is said to be far from rare. Mr. Cooter stated that many are trapped in the area well to the southwest of the lake. Mr. Dufour of the Hudson Bay Post stated that he buys as many as 200-300 skins a year!

One skull was obtained from F. Garneau, taken northwest of Laurentides Park.

Mustela vison lowii Anderson. **UNGAVA MINK**

Female and four young were taken on the bank of Rivière au Saumon, 5 miles southwest of Notre Dame de la Doré. The female was shot while digging up some animal carcasses near the camp. A search disclosed the den under a tree root beside the river, where a No. 0 trap took the four young in one afternoon.

Two adults were taken on the high ground south of the lake. All observed were small and dark. Fur-traders said that mink was the most important fur trapped elsewhere than just around the lake.

Specimens were taken as follows: Notre Dame de la Doré, 5; northwest of Laurentides Park, 2.

Two females measured (in mm.), total length, 452, 452; tail, 154, 142; hind foot, 50, 55.

One male measured (in mm.), total length, 524, tail, 169; hind foot, 62.

The above specimens agree favourably with two near topotypes of *lowii* from Lake Albanel, Quebec, being much darker than specimens of *M. v. vison* from the Maritime Provinces, southern Quebec, and southern Ontario.

The two near topotypes from Lake Albanel, Quebec, are darker than any specimens of *Mustela vison* in the National Museum of Canada collection except one specimen from Sheldon Lake, Yukon, referred to *energumenos*. The colour may be described as intermediate between Van Dyke brown and light seal brown (Ridgway). This form evidently is very well defined.

Ten skulls from Lake St. John were compared with six skulls of *Mustela vison vison* from the Maritime Provinces, southern Ontario, and southern Quebec, and five skulls of *M. v. lowii* from Lake Mistassini (including the type). Adult skulls exhibit the diagnostic characters attributed to *lowii*: cranium—low and narrow; palatine notch—narrow and more pointed. These characters are less evident in the skulls of young animals. Skull measurements (in mm.):

Adult male: condylobasal length, 61; occipito-nasal length, 58; zygomatic breadth, 36.5; cranial breadth, 30; interorbital breadth, 13; length of nasals, 13.

Adult female: condylobasal length, 52.5; occipito-nasal, 52.5; zygomatic breadth, 31; cranial breadth, 27; interorbital breadth, 12; length of nasals, 10.

Lutra canadensis canadensis (Schreber). EASTERN CANADA OTTER

F. Garneau traps otter every year to the northwest of Laurentides Park. A skull, taken during the winter of 1945-46, was obtained.

Compared with 12 skulls of *Lutra canadensis chimo* from Fort Chimo and Lake Mistassini, Quebec, and 6 skulls of *L. c. canadensis* from Ontario and the Maritimes, the Lake St. John skull agrees with *canadensis* in having a shorter interorbital region, brain case narrower and higher, and palate somewhat narrower. The coronoid process of the lower mandible is shorter and less pointed at apex than in *chimo*.

Mephitis mephitis mephitis (Schreber). NORTHEASTERN STRIPED SKUNK

Fairly common, some being seen at every camp. According to Mr. Cooter, they are trapped only by the Indians who bring in the skins quite deodorized. The white trappers rarely attempt to trap them.

Two specimens were taken at St. Félicien.

One male measured (in mm.), total length, 630; tail, 197; hind foot, 78.

One female measured (in mm.), total length, 545; tail, 195; hind foot, 73.

Lynx canadensis canadensis Kerr. CANADA LYNX

Not uncommon in the wooded highlands about the lake. Mr. Cooter at Pointe Bleue buys over a hundred every year. F. Garneau said he takes three or four every winter on his trapline, which is about 20 miles south of the lake. They are taken with snares of steel wire. Three skulls, taken the previous winter northwest of Laurentides Park, were obtained.

Fur buyers in this area say their records do not prove or disprove the existence of a lynx cycle following the rabbit cycle. The local trappers may take other work when economic conditions warrant, so that fur prices and employment conditions have as much influence on the local fur catch as abundance of fur-bearers.

Lepus americanus americanus Erxleben. AMERICAN VARYING HARE

All trappers and fur buyers interviewed were agreed that rabbits were extremely scarce in the winter 1945-46. Except for a juvenile taken near Val Jalbert in August, none was seen in the immediate vicinity of the lake. They were, however, locally more common to the northwest of Laurentides Park. Six were snared here in one week.

Specimens were taken as follows: Val Jalbert, 1; northwest of Laurentides Park, 6.

Four males measured (in mm.), total length, 454 (440-465); tail, 49 (35-60); hind foot, 146 (139-152).

One female measured (in mm.), total length, 461; tail, 45; hind foot, 141.

Four fully adult specimens from Lake St. John agree favourably in coloration with specimens of *L. a. americanus* (12) from Ontario and Saskatchewan, being a greyish brown in contrast to the cinnamon brown of *L. a. virginianus* (4) from southern Ontario and southern Quebec, and *L. a. struthopus* (6) from the Maritime Provinces and Gaspe. Lake St. John specimens also agree with specimens from Ontario and southern Quebec in averaging smaller than either *struthopus* or *virginianus*.

Marmota monax subsp. WOODCHUCK

Woodchucks are extremely common, inhabited burrows being found in every field and clearing about the lake. They have little fear of man; apparently nobody thinks them worth shooting.

Juveniles seen before July 1 were living several to a burrow with their mothers, those seen after July 15 were invariably alone.

Specimens were taken as follows: St. Félicien, 2; Val Jalbert, 1.

One female measured (in mm.), total length, 525; tail, 130; hind foot, 77; weight, 2,630 gm.

The above adult female compared with similar material from New Brunswick (8), and southern Ontario (3), has decidedly darker bases to the underfur, in this respect approaching *ignava*. It is also intermediate in size between *canadensis* and *ignava*. No skulls of the latter are available for examination.

The paucity of material deems it desirable to defer subspecific reference of these specimens until additional material is available.

Tamias striatus griseus Mearns. GRAY EASTERN CHIPMUNK

Found everywhere in woodland and shrubbery, both deciduous and coniferous. Females taken during the first half of June were still nursing.

One chipmunk shot August 2 had his cheek pouches full of berries of the red osier dogwood, *Cornus stolonifera*.

Specimens were taken as follows: St. Félicien, 2; Notre Dame de la Doré, 4; Val Jalbert, 2.

Three males measured (in mm.), total length, 240 (233-244); tail, 95 (91-98); hind foot, 36.5 (36-37); weight, 97 gm. (85-103).

Five females measured (in mm.), total length, 250 (236-264); tail, 98 (91-106); hind foot, 35.5 (34-36); weight, 98 gm. (91-104).

The above specimens are larger, darker, and more greyish than topotypical material of *T. s. lysteri* from Georgian Bay, Ontario.

Tamiasciurus hudsonicus laurentianus Anderson. LAURENTIAN RED SQUIRREL

Plentiful in all wooded areas. They are noisy and quite fearless; it was easy to "squeak up" and shoot as many as desired. Fur buyers say the Indians trap large numbers of them, but white trappers do not think them worth their while.

Specimens were taken as follows: Val Jalbert, 6; Notre Dame de la Doré, 2; St. Félicien, 1; northwest of Laurentides Park, 1.

Four male specimens measured (in mm.), total length, 296 (275-310); tail, 115 (92-124); hind foot, 46 (44-48); weight, 173 gm. (144-202).

Six female specimens measured (in mm.), total length, 292 (286-298); tail, 117 (107-124); hind foot, 47 (46-48); weight, 183 gm. (168-205).

Specimens collected agree in coloration, skull characters, and measurements with topotypical material of *laurentianus* (9) in the National Museum of Canada collection. The sides of the body and the upper part of the tail are more greyish than in *ungavensis* from Waswanipi, Quebec. They also average smaller than *ungavensis*.

The Lake St. John specimens also agree with *laurentianus* in having a proportionately longer rostrum. On the average, the nasals in *laurentianus* are slightly greater than a third of the condylobasal length, whereas in *ungavensis* the nasals average less than a third. Average condylobasal length of the Lake St. John specimens—37.5, average nasal length—13.7.

Because, heretofore, an adequate series of summer specimens from southern Ungava has not been available for examination, the present series of *laurentianus* from Lake St. John and of *ungavensis* (10) from the Lake Mistassini region were critically compared with summer specimens from Eastern Canada.

Colour characters of the various races in summer pelage are best shown in the dorsal aspect of the tail. The extremes are represented by *gymnicus* from the Maritime Provinces, in which the tail is a dull, rusty red, and *hudsonicus* from western Ontario and eastern Manitoba, in which it is a pale yellowish rufous. *T. h. loquax* is more or less intermediate in this respect, although the tail is much brighter than in these two forms, being a rich reddish yellow.

The upper surface of the tail in *ungavensis* is a dull, rusty red, suggesting that of *gymnicus*, being much darker than in *hudsonicus*. Tail coloration in *laurentianus* is quite similar to that of *loquax*, although considerably darker, approaching *ungavensis*.

Of skull characters the size and shape of the rostrum exhibits the greatest geographical variation in Eastern Canada. A long, slender rostrum is characteristic of *laurentianus*, whereas the opposite extreme, a short, broad rostrum, is found in *gymnicus*. On the average, the rostrum of *hudsonicus* tends to be relatively short and broad, although longer and proportionately broader than in either *gymnicus* or *ungavensis*. Arranged on the basis of average rostral length, the five subspecies fall roughly into the following order (from maximum to minimum): *laurentianus*, *loquax*, *hudsonicus*, *ungavensis*, *gymnicus*. Naturally there is considerable overlap, and this character can be employed only in separating the extremes.

Glaucomys sabrinus sabrinus (Shaw). HUDSON BAY FLYING SQUIRREL

Two females were taken in traps set about an abandoned feed cache in dry coniferous wood near Notre Dame de la Doré. F. Garneau said he takes 20-30 every winter in marten sets. The fur has no commercial value.

One female measured (in mm.), total length, 312; tail, 151; hind foot, 42; weight, 155.0 gm.

The above specimens were compared with four females of *sabrinus* from Waswanipi Post, Quebec, and five females of *G. s. goodwini* (type specimens) from Gaspé. The Lake St. John specimens are larger and paler than specimens from Gaspé and New Brunswick, and agree in these respects with specimens from south-central Quebec.

Castor canadensis subsp. BEAVER

Said to be extinct in the neighbourhood of the lake. Beaver are plentiful in Laurentides Park; the overflow migrate outwards each year and are taken almost as soon as they cross the boundary.

Peromyscus maniculatus gracilis (LeConte). LECONTE'S WHITE-FOOTED MOUSE

The rarity of *Peromyscus* was most remarkable. Some trapping was done in low, wet country, and here its absence was understandable. But in one high and dry area nine were taken in 300 trap nights and in another two in 1,930 trap nights. Two breeding females were taken on July 5.

Specimens were taken as follows: Val Jalbert, 2; Notre Dame de la Doré, 5.

Three males measured (in mm.), total length, 163, 163, 168; tail, 83, 79, 83; hind foot, 17.5, 19, 20; weight, 18.7, 16.7, 21.6 gm.

Three females measured (in mm.), total length, 175, 180, 182; tail, 79, 91, 93; hind foot, 19.5; 22, 19.5; weight, 25.1, 20, 25.3 gm.

Compared with a series of *maniculatus* from Hudson Strait, Quebec (5) the Lake St. John specimens are paler dorsally and the tail is slightly longer. They are, however, not quite typical *gracilis*, being slightly darker above, with tail slightly shorter than in specimens from Pancake Bay, Ontario (1). Although obviously intermediate between *gracilis* and *maniculatus*, they are nearer to the former, both in coloration and length of tail (average 85 mm. for 5 adult specimens). C. F. Jackson (1939) described a dark form (*P. m. plumbeus*) from the mouth of Pigou River, on the north shore of the Gulf of St. Lawrence. All adult specimens collected at Lake St. John are white or yellowish white ventrally rather than plumbeous or cinereous as in *plumbeus*. No specimens of the latter form are available for examination.

Clethrionomys gapperi hudsonius Anderson. HUDSONIAN RED-BACKED MOUSE

Locally common in wet woods and scrub. Twenty traps in a wet maple woodlot caught five in 2 days. None was taken in dry or treeless locations. Pregnant females were taken June 26, July 2, and August 6.

Specimens were obtained as follows: St. Félicien, 6; St. Méthode, 3; northwest of Laurentides Park, 2.

Three males measured (in mm.), total length, 149, 133, 146; tail, 41, 35, 41; hind foot, 19.5, 19, 18; weight, 30.8, 23.7, 23.4 gm.

Only one grey-phased animal was taken. Bangs (1895) took 4 greys and 36 reds at Lac Edouard. It would seem that about one-tenth of the population in this area are grey-phased. By contrast, the "*fusco-dorsalis*" phase predominates in *proteus* from Labrador.

The above differ from *ochraceus* and *gaspeanus* in being chestnut dorsally rather than ochraceous, and from *ungava* in that the dorsal stripe is well defined and the ears protrude above the fur. Compared with 16 specimens of *gapperi* from southern Ontario, the Lake St. John specimens are duller and paler dorsally, sides more ochraceous, and underparts a deeper buff.

Microtus pennsylvanicus fontigenus Bangs. QUEBEC MEADOW MOUSE

Abundant in open, wet localities. A few were taken just inside the edge of a wood. Near the northwest corner of Laurentides Park, two were taken in a small beaver meadow surrounded by miles of forest.

The specimens are practically topotypical *fontigenus*, Lac Edouard, the type locality, being less than 70 miles away. Bangs says of this animal, "Nowhere did it make runways like those of *M. pennsylvanicus*, and it appeared to be confined to the forest. I hunted in vain the marshy spots and alder swamps and the cleared fields, places *M. pennsylvanicus* would have delighted in, but found no trace of any *Microtus* there". In the vicinity of Lake St. John the meadow mice, like meadow mice elsewhere, frequent wet open places, shunning the deeper woods.

Pregnant females were found during the month of June.

Specimens were taken as follows: St. Félicien, 11; Val Jalbert, 2; northwest of Laurentides Park, 2.

Nine males measured (in mm.), total length, 149 (127-172); tail, 41 (30-50); hind foot, 20 (19-21); weight, 31.2 gm. (27.3-42.5).

Six females measured (in mm.), total length, 146 (141-164); tail, 40 (35-46); hind foot, 20 (19-21); weight, 35.5 gm. (29-36.5).

Average take—1.5 per 100 trap nights. Best take in 100 trap nights, 11.

The above specimens were compared with a series of twenty-two specimens of *M. p. fontigenus* from Moisie Bay, and Natashquan, Quebec, and five specimens of *M. p. pennsylvanicus* from southern Ontario. The Lake St. John specimens agree with *fontigenus* in averaging slightly darker, although four specimens were indistinguishable from *pennsylvanicus*.

Examination of the skulls revealed a slightly narrower rostrum, as postulated for *fontigenus*, and slightly more rounded auditory bullæ. Both these characters are apparent only in large series of skulls.

In his original description, Bangs (1896), states that *fontigenus* is smaller than the nominate race, skull with more slender rostrum, basi-occipital without distinct median keel. Rand (1943) has pointed out that specimens from Labelle county, Quebec, are inseparable on the basis of size from the nominate race, and the skull is ridged even in specimens from the type locality. In a review of the races of *Microtus pennsylvanicus* from Quebec and Newfoundland, Davis (1936) states that "... this race (*fontigenus*) may prove upon examination of a larger series of specimens to be inseparable from typical *pennsylvanicus*".

Microtus chrotorrhinus chrotorrhinus (Miller). ROCK VOLE

Four specimens were trapped in an area of a few acres south of Val Jalbert. None was actually taking the bait when caught. The area was sloping, deciduous wood, not very wet, with piles of limestone boulders covered with moss and leaf mould.

Bangs suggests that this mouse is wholly diurnal as he found them in his traps only in the evening. All four specimens taken by the 1946 field party were found in the traps on the morning visit. Their stomachs were full, suggesting that they had been foraging for some time.

The two females taken (August 5 and August 17) were both pregnant. A half-grown male was taken August 14. Presumably this rare mouse breeds throughout the summer season.

Specimens were taken as follows: Val Jalbert, 4.

One male measured (in mm.), total length, 116; tail, 45; hind foot, 19.5; weight, 38.6 gm.

Two females measured (in mm.), total length, 148, 163; tail, 40, 40; hind foot, 19.5, 20; weight, 25.1, 49.5 gm.

The above agree favourably in colour with *chrotorrhinus* from Ontario (11) and Quebec (6). No specimens of *M. c. rarus* from Labrador are available for examination, but specimens from Moisie Bay have been referred to *chrotorrhinus*.

Ondatra zibethica zibethica (Linnaeus). EASTERN MUSKRAT

Very common in marshy habitats all about the lake, constituting the principal source of income for the local trappers. The best area for them is said to be the "îles flottantes" on the lower Mistassini River. These are formed of great masses of sphagnum that grow out along the water's edge from the great reed beds in the river. Some of these islands are old and thick enough to support trees.

Mr. Cooter stated that in a bad rabbit year, such as 1945-46, foxes are driven to prey upon young muskrats, and as a result very few small skins are taken. In the spring of 1946 he bought more "extra large" muskrat skins than any other size, which he believes only happens at the bottom of the rabbit cycle.

Specimens were taken as follows: northwest of Laurentides Park, 4; Notre Dame de la Doré, 1; St. Méthode, 1; St. Félicien, 1.

Two males measured (in mm.), total length, 663, 538; tail, 280, 243; hind foot, 80, 75; weight, 1,475, 891 gm.

Two females measured (in mm.), total length, 545, 540; tail, 252, 247; hind foot, 81, 82; weight, 1,235, —, gm.

The above specimens agree favourably in coloration with specimens of *O. z. zibethica* from New Brunswick.

The skulls agree with those from Nova Scotia (5), and New Brunswick (2) in being generally heavier than those of *aquilonea* from Fort Chimo, Quebec (4), and in having a relatively shorter and broader rostrum.

Rattus norvegicus (Erxleben). BROWN RAT

This animal was taken in mink and muskrat sets in marsh and forest. One was taken in dense woods 16 miles from any permanent human habitation. Another was shot while swimming a creek in open country. Local trappers say they are caught in trappers' sets even in the winter.

Mus musculus domesticus Ratty. HOUSE MOUSE

One (too damaged to keep) was obtained from a small boy at Val Jalbert. The inhabitants say they are common in houses and barns.

Zapus hudsonius canadensis (Davies). QUEBEC MEADOW JUMPING MOUSE

Trapped along streams and ditches, and in grass and scrub. A few were taken in a woodlot.

Pregnant females were taken July 6 and 7. An almost full-grown juvenile was taken July 2.

Specimens were taken as follows: Val Jalbert, 3; St. Félicien, 3; Notre Dame de la Doré, 3.

Four males measured (in mm.), total length, 211 (204–219); tail, 133 (126–138); hind foot, 31.4 (31–32); weight, 16.0 gm. (15.6–16.6).

Four females measured (in mm.), total length, 208 (202–214); tail, 127 (122–135); hind foot, 30 (29–31.5); weight, 15.8 gm. (12.2–17.6).

Specimens collected differ from *Z. h. ontarioensis* from southern Ontario (11) in that the dorsal stripe is well defined, and from *hudsonius* in that the colour of the sides is deeper and richer. In these respects they agree with specimens of *Z. h. canadensis* from Gaspé (1) and New Brunswick (5). Anderson (1942) refers specimens from Valcartier, 20 miles northwest of Quebec city, to *canadensis* and states that specimens from Labelle and Gatineau counties, Quebec, are intergrades between *canadensis* and *hudsonius*, although nearer to the former.

Napaeozapus insignis algonquinensis Prince. ALGONQUIN WOODLAND JUMPING MOUSE

Apparently not very common. One was taken near St. Félicien in a patch of mixed woodland. A male, a female, and two juveniles (possibly a single family) were taken in a deciduous woodlot above Val Jalbert. The male, taken August 9, was already very fat.

One male measured (in mm.), total length, 253; tail, 157; hind foot, 33; weight, 31.7 gm.

Two females measured (in mm.), total length, 239, 242; tail, 152, 148; hind foot, 33, 32.5; weight, 18.4, 24.3 gm.

The above specimens differ from *abietorum* (12) in that the colour of the sides is bright, lacking the clay colouring of the sides of that form. Compared with a small series of *saguenayensis* (4) in the National Museum of Canada collection (including the type specimen), they are slightly paler dorsally and the orange-tawny of the sides is brighter, agreeing in these respects with specimens of *algonquinensis* (5) from southeastern Quebec and Ontario.

Erethizon dorsatum dorsatum (Linnaeus). EASTERN CANADA PORCUPINE

The skull of a porcupine killed by a car was obtained. Otherwise no signs of any were seen in the district.

The above agrees with skulls from northern New Brunswick in having a narrow rostrum and orange incisors in contrast with a specimen of *E. d. picinum* from Chimo, Quebec, in which the rostrum is stout and the incisors dull yellow.

Alces americana americana (Clinton). EASTERN MOOSE

Tracks of this animal were noted everywhere in the region except in the cultivated lands immediately surrounding the lake. They are very shy, which is not surprising considering the degree to which they are hunted.

Rangifer caribou caribou (Gmelin). EASTERN WOODLAND CARIBOU

In Bangs' time the caribou were still found at the Lac Edouard 70 miles south of Lake St. John. Today they have completely disappeared from the Lake St. John area, and according to the inhabitants, are certainly not found closer than 50 to 75 miles north of the lake, if there.

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PACHYRHINOSAURUS¹ CANADENSIS, REPRESENTING A NEW FAMILY OF THE CERATOPSIA, FROM SOUTHERN ALBERTA

By C. M. Sternberg

INTRODUCTION

Some time ago J. S. Stewart reported seeing part of a dinosaur skull in a hard concretion on the north side of Little Bow River, east of Carmongay, Alberta. In 1945, O. A. Erdman, another geologist, forwarded some fragments of a skull of an unknown dinosaur that he had collected from Scabby Butte, 19 miles south of Stewart's locality. During the 1946 field season the writer visited the two localities and found that the two specimens belong to the same undescribed genus. The Scabby Butte specimen, No. 8860 N.M.C.², was weathered completely out of the rock and scattered over the hillside. Apparently much of the specimen had been taken away by settlers who have used this spot as a picnic ground for many years. Preserved parts suggest that it was as large as or larger than Stewart's discovery, No. 8866, N.M.C. About 300 yards southwest of Stewart's locality, student assistant R. Steiner located a third skull that represents the same genus. This last-mentioned specimen, No. 8867 N.M.C., is smaller than the others and is laterally compressed. Because of this lateral crushing, it has the appearance of being a much narrower head, but for the present these differences are regarded as due to crushing of a younger animal. The Scabby Butte material may represent more than one individual and certain pieces, which are identified as premaxillæ (Plate XXI), suggest a much longer nose than the other specimens, but for the present all are referred to the same species. The smaller one, No. 8867 N.M.C., is chosen as the type.

Our new species has several ceratopsian characters yet it does not fall within either of the known families of the Ceratopsia. It is proposed to erect a new family, the Pachyrhinosauridae, which is placed in the suborder Ceratopsia. At present it is not feasible to attempt to determine which are family, generic, or specific characters. The horizon has been mapped as Edmonton and Stewart regarded it as Lower Edmonton. The specialized development, the large massive head and the great thickness of bone is suggestive of the freakish development that took place among some of the dinosaurs near the very close of the Cretaceous, about Lance time.

SYSTEMATIC DESCRIPTION

Order,	Ornithischia
Suborder,	CERATOPSIA
Family,	PACHYRHINOSAURIDAE N.F.

Pachyrhinosaurus canadensis N.G. & S.

Holotype. No. 8867, National Museum of Canada, consists of skull without lower jaws and lacking the beak and back part of the crest, laterally compressed.

¹ Thick-nose-saurian.

² The fossil vertebrate collection has been transferred from the Geological Survey to the National Museum.

Horizon. Edmonton formation, Upper Cretaceous.

Locality. Near centre of SW. $\frac{1}{4}$ sec. 24, tp. 14, rge. 23, W. 4th mer., on the north side of Little Bow River 50 feet above the river, in a sandy clay.

Paratype. No. 8866, N.M.C., consists of anterior part of skull with right lower jaw but lacking the beak, collected from same horizon, 300 yards northeast of type.

Characters. Skull large, massive, rectangular, narrowing very rapidly in front to a beak; top of head very broad, greatly thickened, flat or concave superiorly; no horncores but broad flat superior surface probably covered with a chitinous sheath thus forming a battering-ram; external surface with vascular markings; sides of nasals coarsely striated and superior surface pitted, suggesting rapid deposition of bone; no antorbital fossa; orbits small, circular; crest short, rounded, and thin; occipital condyle spherical, pointing strongly downward; jaws short, deep, and massive; teeth short, thick, and with partly bifurcated roots.

In the Protoceratopsidae (1)¹ and the Ceratopsidae (3) the skull is triangular, narrowly rounded superiorly, the nasals, except for horncore, are thin, the occipital condyle points only slightly downward from the horizontal and horncores are usually developed. In our new species, the skull is rectangular, the breadth at the anterior end of the maxillæ is almost as great as at the back of these bones, the superior surface is broad and flat and the bone is greatly thickened. The occipital condyle points downward at almost right angles to the superior surface of the skull, suggesting that the head was carried with the nose pointing strongly downward and the top of the head was used as a battering ram.

The premaxillæ somewhat resemble those of the short-crested Ceratopsidae but are very high and, compared with the rest of the skull, the beak is very narrow. These bones are not complete antero-inferiorly and we have no knowledge of the exact shape of the beak, but it was narrow and very deep. We have no proof of a rostral bone but no doubt one was present. The superior surface of the united premaxillæ is moderately broad and rugose and overhangs the smooth median septum, which divides the external nares almost to the descending branch of the nasals. This septum is not fenestrated and the bone is much thicker than in any other ceratopsian.

Plate XXI shows what is identified as part of the premaxillæ of specimen No. 8860. The inferior surface appears to be complete except in the posterior one-third. If this interpretation is correct, the nose of this individual was much longer and lower than in the other specimens and the median septum did not extend as far back from the tip of the beak. This specimen may represent a distinct species, but it is too fragmentary for positive determination. It shows the same distinctive bone structure and coarse striation as are seen in the type and paratype and there is no doubt but that all the specimens belong to the same genus. I have never before seen this type of bone structure or such a massive skull.

The nasals are very deep and broad, and superiorly they are composed of thick massive bone that is pitted and coarsely striated latterly. In the type the nasals are fully 7 inches thick and in the paratype they consist of 10 inches of solid bone. They probably were covered with a thick horny sheath, but no pointed horns.

¹ These numbers refer to References, page 114.

In the paratype, Plates XIX and XX, there is no lateral crushing and the top of the head, in front of the orbits, is a broad thick mass of solid bone. This whole mass is regarded as nasals, though it is possible that the prefrontals enter into its formation. That part above the nasal excavation is nearly flat and roughened superiorly and gradually broadens as it proceeds backward. On the lateral side of each nasal, above the posterior edge of the excavation, there is a knob about the size of a man's fist. The greatest breadth of the skull, as preserved, is at this point. Behind these expansions the skull is slightly narrower, the sides are parallel, and strongly striated and the superior surface slightly concave and pitted. Below the striations, about 7 inches below the top, the bone is grooved horizontally suggesting the base of a huge horny mass. This sulcus-like constriction seems to extend across the skull above the anterior edge of the orbit and delimit the massive nasals. This sulcus does not extend forward beyond the lateral knobs of the nasals. In the paratype, the top of the head is not preserved behind this thickened mass.

In the type the thickened nasals stand up above the bones between the orbits. This may be the result of postmortem crushing. The prefrontals and frontals are broad and thick but their limits cannot be determined because no sutures are discernible. Above and just back of the orbits there is a deep subcircular pit in the top of the head. This may represent a folding of the frontal bones, similar to that in the Ceratopsidae (4), or it may be abnormal. The bone is so thoroughly fused, thickened, and crushed that one cannot be certain of the details of the depression, and this area is not preserved in the paratype. The orbit is of moderate size, circular and much lower than in the Ceratopsidae. There is no buttress on the anterior edge.

The maxilla, jugal, and quadrate are ceratopsian-like but shorter and heavier. The quadratajugal has worked to the inside of the quadrate and does not appear from the external view, (Plate XVIII Qj). The squamosal resembles that of *Styracosaurus* but is even shorter than in that genus and the bone is fairly thin. (2) The parietals are thin and thoroughly fused as in the Ceratopsidae, but they are not complete, so it is not possible to say if they were fenestrated or to give their length. It is believed that they were short and rounded.

The occipital condyle is spherical, as in the horned and armoured dinosaurs. It is splendidly preserved in the type and, as shown in Plate XVIII, points downward and backward. The basioccipitals are very massive and stand at almost right angles to the top of the head. The position of these bones shows that the neck was strongly arched or, what is more likely, the nose was depressed so that the top of the head faced forward. Little can be said about the palate, but the paratype shows the maxillæ meeting on the midline.

The right mandible, of the paratype, Plate XIX, is well preserved and, except for a part of the front end of the dentary, is complete. The dentary is short and high. Anteriorly it is thin but as it proceeds backward it thickens greatly and the coronoid process stands well out from the tooth magazine. Several large foramina pierce the external surface of the dentary in its anterior half. The coronoid process, angular, surangular, and articular are very massive and the whole posterior part of the mandible

suggests great power. Except for their great bulk, these bones resemble those of *Triceratops* (3). The rock was so hard that it was not possible to work out the details of the splenial. The preserved length of the right mandible is 530 mm. and it is estimated that 50 mm. is missing from the tip. The height of the dentary is 130 mm. (external view) to the base of the teeth, which stand up 50 mm. above the bone. The lingual-buccal thickness of the dentary, anteriorly, is 25 mm. and the greatest thickness

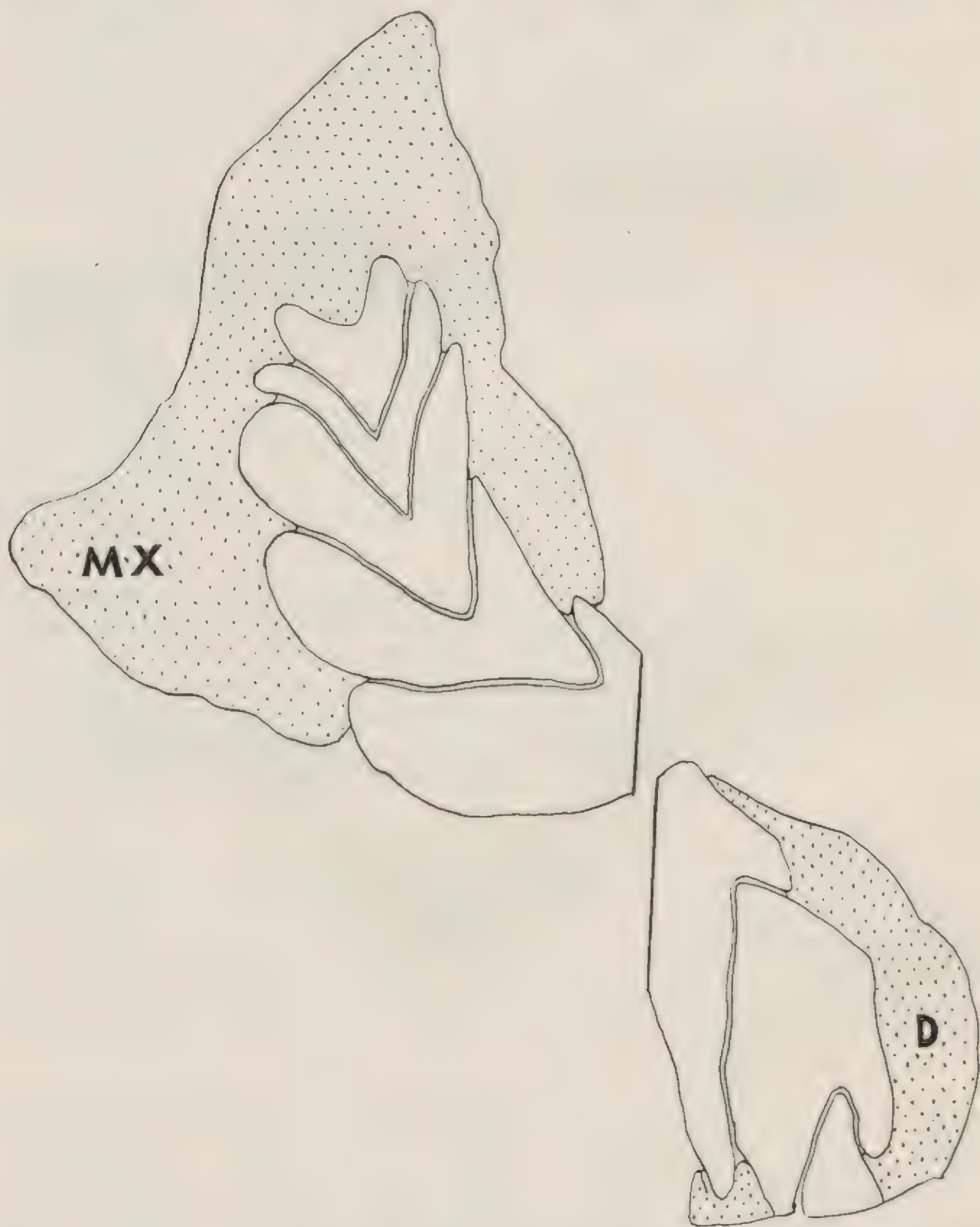


Figure 5. Crosssection of right maxillary and dentary teeth from near the centre of the series of *Pachyrhinosaurus canadensis*. Paratype No. 8866, N. M. C. Natural size.

through the coronoid process is 150 mm. From the back of the coronoid process to the posterior edge of the articular is 190 mm. and the height of the prearticular is 190 mm. See Plate XIX for a fair idea of the mandible of the paratype.

The teeth are preserved in both maxilla and dentary in the paratype. Figure 5 shows a cross-section of the complete magazine of teeth in the maxilla and part of the dentary magazine. The teeth resemble those of the Ceratopsidae but are much thicker (lingual-buccal diameter) and the roots are only partly bifurcated in the functional tooth. There is only one tooth in the triturating surface. Of the five maxillary teeth in the vertical series, the three youngest (uppermost) stand almost vertical, and the tip of the crown runs well down in the lower or older tooth, but the functional tooth and the one next above it curve sharply inward and the outer division of the root is much more developed. This is very noticeable in the functional tooth where the inner division of the root, or fang, is so much reduced that the tip of the crown of the succeeding tooth seems to fit in a notch on the inner face of the functional tooth. The arrangement of the dentary teeth is similar but here the external, or buccal, division of the fang is relatively short. The teeth stand more nearly vertical than in the maxillary magazine and the body of the tooth is longer. The dentary bone reaches up almost to the top of the teeth on the inner side but on the external, or triturating, face the crown and long fang stand well above the dentary bone. This arrangement allows a very long shearing face, which often extends onto the root. The cross-section was taken of part of the magazine of teeth just ahead of the midlength of the dentary (Figure 5). This shows the inner division of the fang extending 6 mm. below the tip of the succeeding tooth, whereas the external division extends 35 mm. below the same tip. The tooth next below the functional one shows a lingual-buccal diameter of 20 mm. and the tip of the crown stands 25 mm. above the tip of the succeeding tooth. One or two anterior teeth are missing from the dentary series but the complete number is believed to be 35.

RESTORATION

The restoration model of the skull (Plates XXII and XXIII) was executed by the writer and was made one-sixth natural size. It is here reproduced about one-half the size of the model. In this I have attempted to show a very heavy, broad skull narrowing rapidly in front of the massive maxillæ. The nasals and frontals may have been covered by a broad, thick, horny boss but it does not appear likely that there was a pointed horn. The lower external point of the jugal is somewhat swollen and rugose and it is probable that there was a small lateral horn similar to that on the so-called epijugal of some of the Ceratopsidae. The crest is shown as short and round, but there is no positive evidence regarding the length of the parietals. The mouth opens back to about the beginning of the tooth row. It is believed that where the vegetation was shredded, as it was by the Ceratopsia, that the mouth would not open far back as in the flesh-eaters, but that the cheek covering would form a sort of pouch to retain that part of the food that fell outside the triturating surface. It would appear that this was even more essential in forms where the food was shredded than where it was masticated.

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Pachyrhinosaurus canadensis. Holotype No. 8867, N. M. C. Skull. Left side. $\frac{1}{4}$ natural size. (Negative No. 99764)



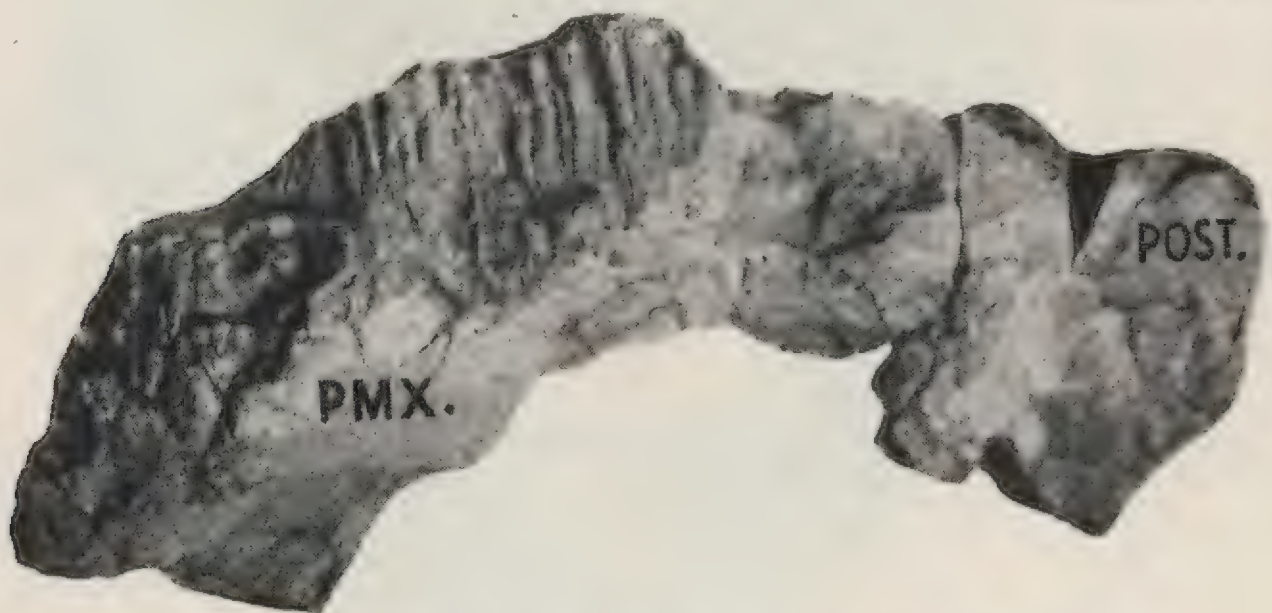
Pachyrhinosaurus canadensis. Holotype No. 8867, N. M. C. Skull. Left side with part of the bones removed to show inner view of bones of the right side. $\frac{1}{4}$ natural size. (Negative No. 99763).



Pachyrhinosaurus canadensis. Paratype No. 8866, N. M. C. Skull and lower jaw from right; $\frac{1}{3}$ natural size. (Negative No. 101621).



Pachyrhinosaurus canadensis. Paratype No. 8866, N. M. C. Skull from left front. Taken to show broad nasals. About $\frac{1}{2}$ natural size. Due to the angle of the view there is foreshortening. (Negative No. 100013)



Pachyrhinosaurus canadensis. Cat. No. 8860, N. M. C. Premaxillae from left side. About $\frac{1}{2}$ natural size. (Negative No. 101618)

PLATE XXII



Flesh restoration of head of *Pachyrhinosaurus canadensis*. About $\frac{1}{2}$ natural size. Modelled by C. M. Sternberg. (Negative No. 101615)

PLATE XXIII



Flesh restoration of head of *Pachyrhinosaurus canadensis*. About $\frac{1}{2}$ natural size. Seen from above.
Modelled by C. M. Sternberg. (Negative No. 101616)

